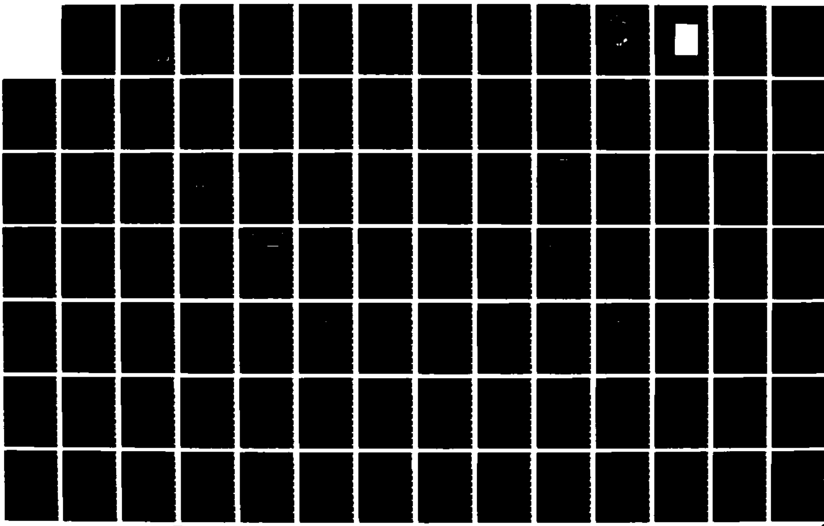
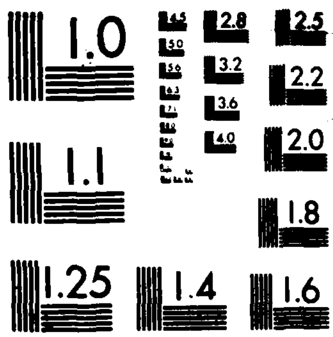
AD-A177 776 FASINEX (FRONTAL AIR-SEA INTERACTION EXPERIMENT JANUARY - JUNE 1986) CRUI..(U) WOODS HOLE OCEANOGRAPHIC INSTITUTION MA N J PENNINGTON ET AL. OCT 86 WHOI-86-36 1/2

UNCLASSIFIED N00014-84-C-0134 F/G 8/3 NL





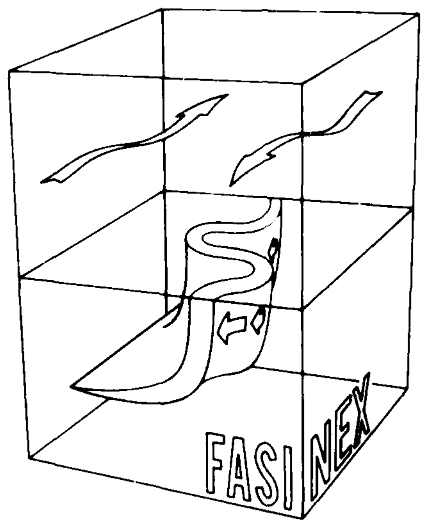
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

WHOI Technical Report 86-36

2

FASINEX

(Frontal Air-Sea Interaction Experiment)



Cruise Summaries for FASINEX Phase Two

R/V Oceanus Cruise 175
R/V Endeavor Cruise 141

Nancy J. Pennington
Robert A. Weller

October 1986

FASINEX Technical Report #14

WHOI-86-36

FASINEX
Frontal Air-Sea Interaction Experiment
(January - June 1986)

Cruise Summaries for FASINEX Phase Two

R/V OCEANUS Cruise 175
R/V ENDEAVOR Cruise 141

by

Nancy J. Pennington
Robert A. Weller

Woods Hole Oceanographic Institution
Woods Hole, Massachusetts 02543

October 1986

FASINEX Technical Report #14

Funding was provided by the Office of Naval Research
under contract No. N00014-84-C-0134, NR 083-400.

Approved for Distribution:

Robert C Beardsley

Robert C. Beardsley, Chairman
Department of Physical Oceanography

Abstract

The Frontal Air-Sea Interaction Experiment (FASINEX) was a study of the response of the upper ocean to atmospheric forcing in the vicinity of an oceanic front in the subtropical convergence zone southwest of Bermuda, the response of the lower atmosphere in that vicinity to the oceanic front, and the associated two-way interaction between ocean and atmosphere. FASINEX began in the winter (January 1986), concluded in the early summer (June 1986) and included an intensive period in February and March. The experiment took place in the vicinity of 27°N, 70°W where sea-surface-temperature fronts are climatologically common.

Measurements were made from buoys, ships, aircraft and spacecraft. This report summarizes the shipboard work done on R/V OCEANUS and R/V ENDEAVOR during Phase Two, the dual ship/multi-aircraft measurement period. The two ships worked individually, jointly and as ground truth for the aircraft during the month. Each ship carried specialized instrumentation for measuring oceanographic and meteorological parameters. Information describing the sampling stategy, station positions and times are included. This report contains summaries of the data collected and some preliminary results.

Table of Contents

I. Introduction

The Frontal Air-Sea Interaction Experiment (FASINEX)(see Stage and Weller, Bulletin of the American Met. Soc, Vol 66, No.12, 1985 and Vol 67, No. 1, 1986 for further detail on the background scientific objectives, and the experimental plan of FASINEX) was planned to investigate local air-sea interaction processes at an oceanic front. North of about 25°N in the mid-Atlantic Ocean the prevailing westerly winds tend to carry the surface water to the south. South of about 25°N the trade winds carry surface water to the north. In the region southwest of Bermuda the cooler water from the north meets the warmer water from the south, a series of oceanic fronts are formed. The fronts are marked at the surface by abrupt changes in sea surface temperature. The surface temperature may change by as much as 3°C in less than a kilometer. Associated with these fronts are surface currents with speeds of approximately 1.5 knots.

The FASINEX field experiment began on January 7, 1986 when R/V KNORR sailed on cruise 119. This was designated FASINEX Phase One, the mooring deployment cruise. Once a sea surface temperature front was located by satellite imagery and an extensive XBT survey, the mooring instrumentation was set, and began recording and telemetering data. Meteorological and oceanographic logs were maintained. Phase Two immediately followed the one month deployment cruise. R/V OCEANUS and R/V ENDEAVOR returned to the FASINEX area to make oceanographic and meteorological measurements for approximately another month. During this time period, six aircraft including the NRL P3, NASA C-130, NCAR Electra, NASA P3, NOAA P3, and NASA Electra completed 41 flights measuring atmospheric and oceanic conditions. Phase Three, the mooring recovery cruise, KNORR 123, returned to the FASINEX area in early June 1986. The instrumentation that recorded data on station for the six month period was retrieved. Meteorological and oceanographic logs were again maintained. The field program ended with the ship returning to Woods Hole. The Phase Two cruises are summarized in this report. The summary of Phases One and Three is WHOI Report #86-35 (FASINEX Document #13). Figure One shows an artist's concept of the mooring array bracketing a frontal feature and the joint work of the ships and aircraft during the one month of intensive scientific measurements.

The overall goals of the ship and aircraft scientists during FASINEX were:

1. To describe the horizontal and vertical structures of the oceanic and atmospheric boundary layers in the region in and around an oceanic front.
2. To investigate the relation between structures found on each side of the air-sea interface.
3. To study the physical processes associated with air-sea interaction in the vicinity of an oceanic front.

During Phase Two, the ships and aircraft worked jointly to measure with high resolution, over a limited time, the temporal and spatial variability of a frontal feature and investigate the processes acting within the front. The ships primary goal was to observe and characterize the three dimensional

and across frontal features. The meteorological goals were to collect sections (radiosonde and atmospheric sounder) perpendicular and parallel to the front, and to make stress measurements in the vicinity of the moored array; both these efforts were done in conjunction with the aircraft flights. This report will summarize only the shipboard work done during Phase Two.

Scientific goals dictated that the field work during Phase Two focus on an oceanic front, so the area of interest shifted to the position of a nearby front rather than remain at the moorings set during Phase One. The frontal feature studied was the same one that moved northeast from the central mooring array. At the conclusion of Phase Two, a final survey south to the mooring array area showed that another front had moved into the area. The characteristics of this front were very different from the original front located in the same area. (Throughout the six month experiment, frontal features moved through the central array. This is clear from the SST signal seen by the buoy instrumentation.)

A brief description of the instrumentation on both ships and its capabilities will serve as an overview of the oceanographic and meteorological parameters measured during Phase Two. Within this report, participant summaries are included when available.

OCEANUS surveyed the frontal region with an underway Doppler Log. SST and velocity profiles were collected for all but 2 days of the 26 days the ship was in the FASINEX region. Continous SST was measured by the ship's SAIL (Serial ASCII Interface Loop) system. A thermosalinograph also continously recorded surface temperature and salinity. Fifteen minute buckets were taken as part of an underway oceanographic watch. Hourly salinity samples were taken. For approximately 17 days of the cruise the SeaSoar gathered temperature, salinity and oxygen data in a range from 30-350 m while the ship steamed at 8 kts. This instrument output a real time display and with software on board a large scale picture of the front was available with 24 hours of the survey. A real time profiler (RTP) section was made across the front. The profiler measured u,v and w components of velocity along with temperature and conductivity. Two forms of drifters were used on OCEANUS. Neutrally buoyant drifting Vertical Current Meters (VCM) which measured pressure, temperature and turns (allowing for a vertical displacement calculation) and Scripps' surface and 50 m drogued drifters which measured surface and nearsurface currents. CTD stations were taken in the vicinity of the moorings as a last task of the cruise before the ship headed back to Woods Hole. Radiosondes were taken as part of Ken Davidson's meteorological program on both ships.

ENDEAVOR gathered oceanographic data with two profilers. A newly designed free fall microprofiler made 39 dives. The instrument measured temperature, conductivity and pressure (using a standard CTD unit), small scale temperature, conductivity and velocity with special microstructure probes, fine scale velocity variations with acoustic current meters and accelerometers. EPSONDE, another small scale profiler operated in a tethered free fall mode, transmitting its measured parameters to the surface using a kelvar multiconductor line. This instrument completed 39 stations, doing multiple profiles at each position. It measured microstructure velocity fluctuations, temperature gradiant microstructure and mean temperature,

conductivity and pressure. XBT surveys were run to locate the front. A total of 70 CTD stations were completed, including a section in conjunction with an overpass by GEOSAT. A WOTAN(Wind observation through Ambient Noise) drifting mooring was deployed 12 times. It carried four different transducers to measure acoustic backscatter and a WOTAN measuring bubble clouds. Underway meteorological data was collected using the ship's SAIL system. A Doppler log operated during part of the cruise.

Although this is a cruise/data report for the shipboard work, the timing of the aircraft overflights is included. Most flight days the joint work required the ships' positioning themselves on opposite sides of the front and heading into the wind measuring meteorological data for ground truth. Communication was maintained with VHF radios when the aircraft were in the FASINEX area.

Total Flights:	41
NRL P3	12
NASA C130	11
NCAR Electra	7
NASA P3	5
NOAA P3	4
NASA Electra	2

Feb	10	NRL P3
	14	NRL P3
	16	NRL P3, NCAR Electra, NOAA P3
	17	NRL P3, NCAR Electra, NOAA P3
	18	NRL P3, NCAR Electra, NASA C130, NASA P3
	20	NCAR Electra, NASA C130, NASA P3, NASA Electra, NOAA P3
	21	NCAR Electra, NASA C130, NASA P3, NASA Electra, NOAA P3
	22	NASA C130
	24	NCAR Electra, NASA C130, NASA P3
	25	NRL P3, NCAR Electra
	26	NRL P3, NASA C130, NASA P3
Mar	1	NRL P3, NASA C130
	3	NRL P3, NASA C130
	5	NRL P3, NASA C130
	7	NRL P3, NASA C130
	8	NASA C130
	9	NRL P3

Communication was maintained via two one hour sessions daily on the ATS system. Charlie Eriksen manned the FASINEX office at the Bermuda Biological Station for the month long Phase Two. Aircraft scientists, based in Bermuda at the Naval Airstation, either relayed information through Charlie or coordinated flight plans with the ships during the evening FASINEX hour by stopping by the office to discuss upcoming flights with the ships. This allowed for daily updates of the field work.

The numerous sampling patterns used by the two ships and six aircraft allowed for many different data sets to be gathered under different oceanographic and atmospheric conditions during the field program. Until data sets are shared and intercomparisons made, it will be difficult to draw a conclusion of the overall success of the experiment, but because of the variability of the oceanographic and atmospheric conditions, the successful coordination among the aircraft with their complex joint work and with the ships, and the data return from the instrumentation on the ships, aircraft and buoys, the field program accomplished all the tasks scheduled.

The FASINEX area was designated to be a four by five degree box southwest of Bermuda. The coordinates are 25° to 30° North and 72° to 68° West. Two charts are used in this data report. FASINEX Total Area (Figure 2) includes the East Coast and Bermuda to identify the area of the western Atlantic. Area 1 (Figure 3) is an expanded scale of one section of the Total Area chosen to include all the oceanographic and meteorological sampling done by the ships involved in all three phases of FASINEX. A solid square identifies the central mooring array location at approximately 27°N, 70°W.

The fronts seen in the AVHRR images and the underway oceanographic sampling make up the Figure 3 composite plot. The front locations for January 6-7 and January 21-22 were taken from AVHRR images. Bucket temperature data from the OCEANUS 175 radiator pattern were used for the February 15 front location. The locations for the February 27 and March 4 frontal positions were also taken from the 15 minute bucket temperatures on OCEANUS.

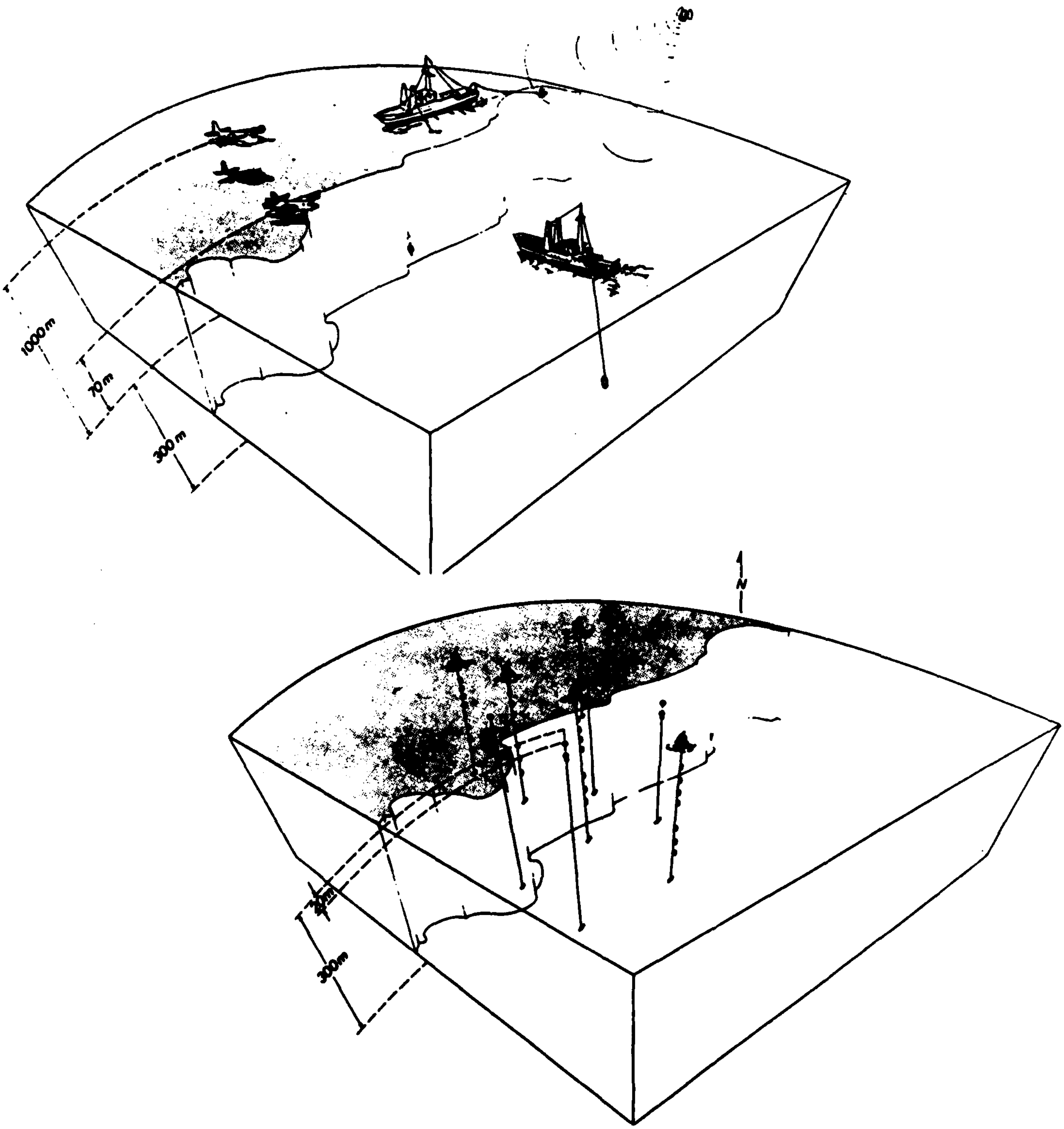


Figure 1. Artist's conception of frontal regions during Phase One, the mooring work (lower), and Phase Two, the intensive scientific period (upper).

FASINEX Total Area

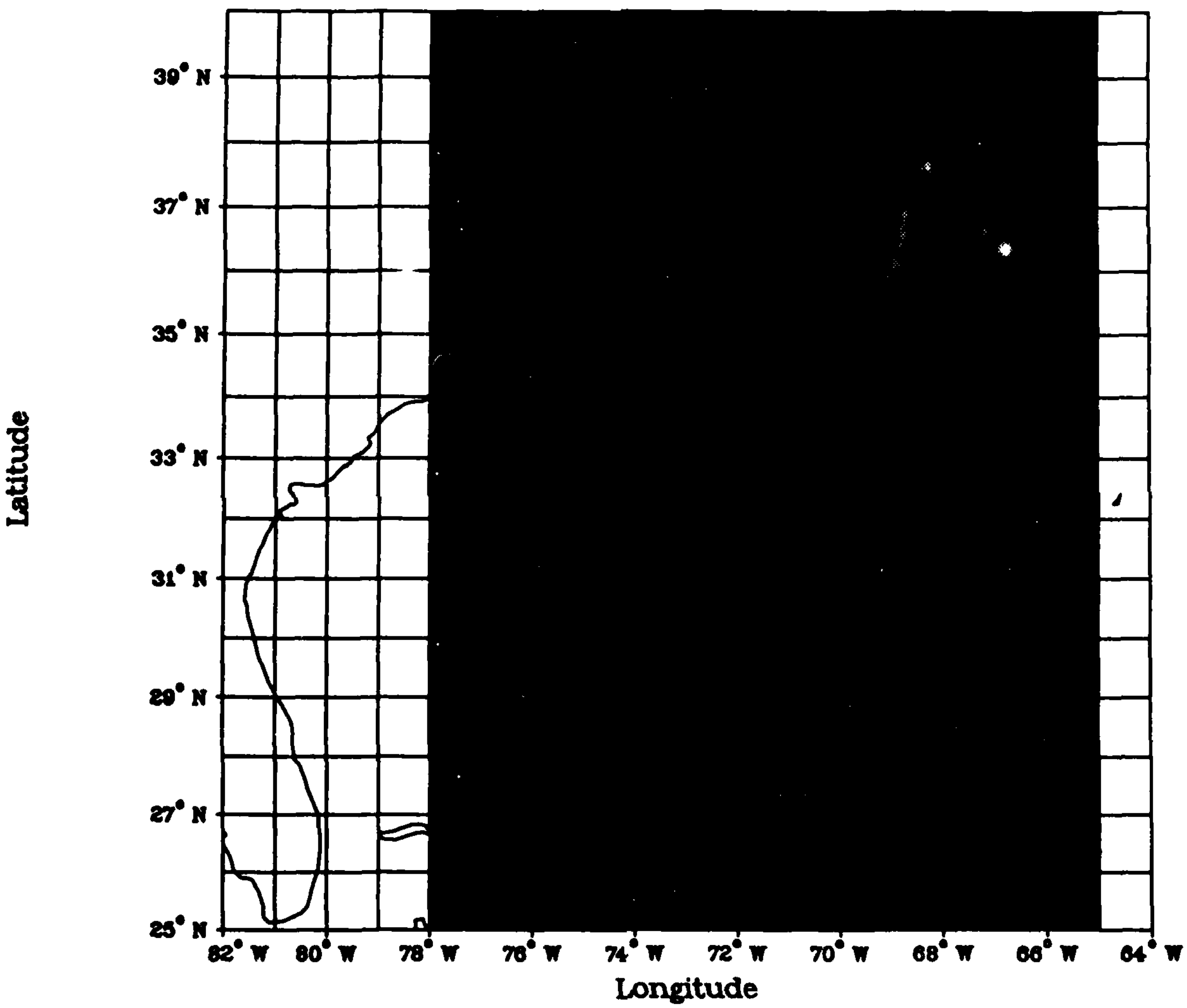


Figure 2

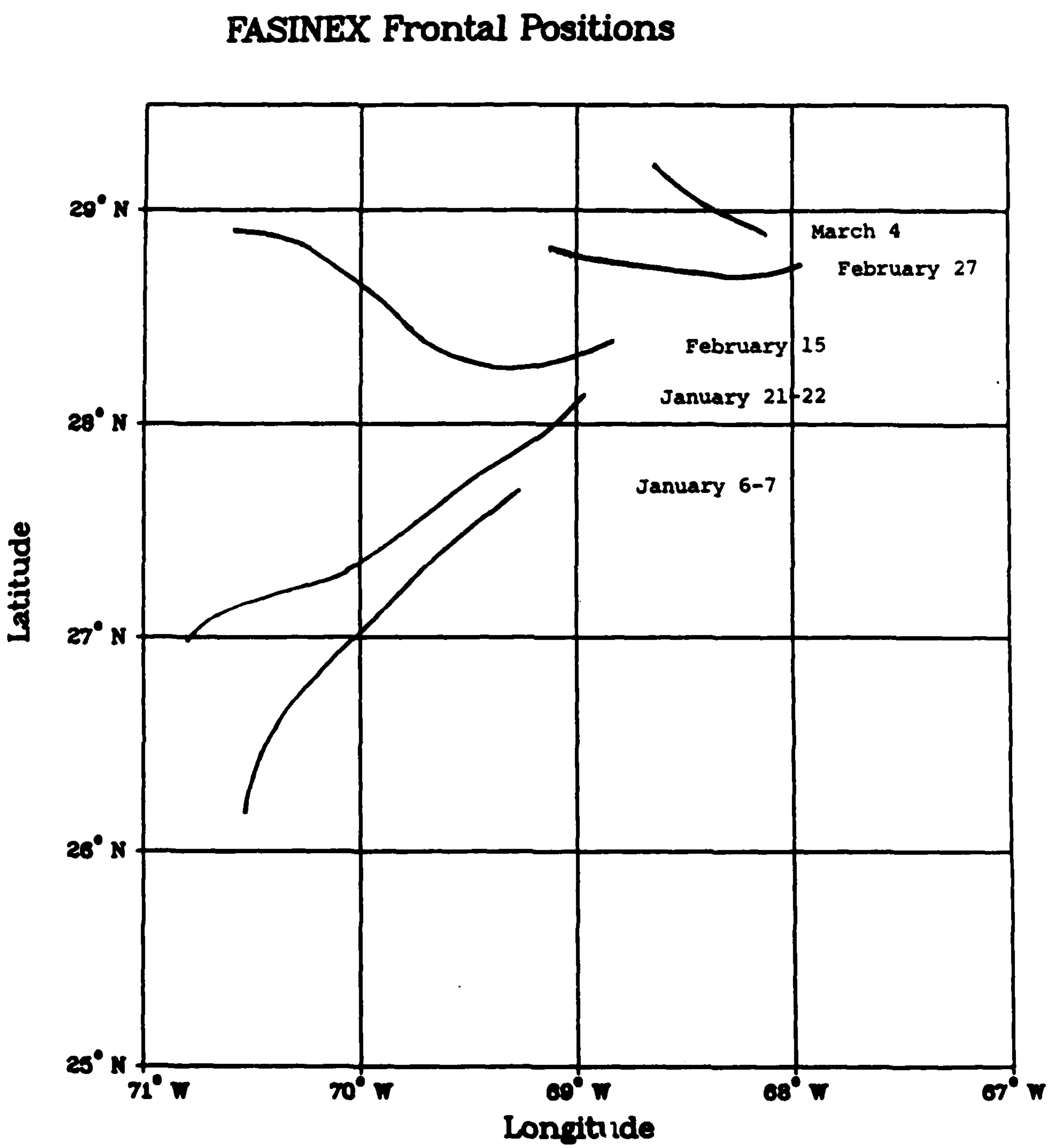


Figure 3: Area 1 showing Frontal Positions.

II. Cruise Narrative - OCEANUS 175

a. Summary

OCEANUS sailed on February 5, 1986 for Bermuda to rendezvous with ENDEAVOR and several members of the KNORR (Phase One) scientific party. Because of steering problems, she returned to Woods Hole and was delayed three days while repairs were completed. She departed again on February 8 and arrived at St Georges, Bermuda on February 11. Scientists on board during the transit set up the main lab and tested instrumentation. When the ship arrived at the dock, the party transferring from KNORR immediately loaded their gear, so the ship was ready to sail early on the February 12. Due to a delay of an air-shipped IC for a computer on ENDEAVOR, the OCEANUS did not sail until 1900.

A watch was started at 1600 on February 13. The oceanographic underway log that was maintained during the cruise included time, LORAN C latitude and longitude, bucket sea surface temperature (SST), SAIL SST, and towed fish SST. During specific times, thermosalinograph SST and SeaSoar mixed layer depth and temperature were recorded. A half hour meteorological log including time, LORAN C latitude and longitude, wind speed and direction, barometric pressure, and dew point (wet and dry bulb temperatures) was maintained throughout the cruise.

The ship arrived in the FASINEX area where ENDEAVOR had located a strong frontal feature late on February 13. This location was approximately 60 miles north of the moored array. Because of rough seas and high winds, the SeaSoar was deployed to run a survey down south to box in the moored array looking for any features that might be present but did not show on the satellite imagery. This survey took 48 hours. During that time the first overpass of the NRL P3 took place. The SeaSoar was hauled just before rendezvousing with ENDEAVOR on February 15 to transfer some XBTs, the computer IC chip and some data.

Balloon launches began on February 13. OCEANUS and ENDEAVOR alternated launching radiosondes. Five to seven balloons were launched each day between the two ships, with additional launches on aircraft days.

On February 16 at 1413, a second SeaSoar survey began while the ENDEAVOR tow-yoed in the front. An eight leg radiator pattern was run to locate the front and measure its scale and orientation. This survey continued until February 20. At that time a bucket survey was started to locate the front for deployment of the SIO drifters and the VCMs. For five days, SIO drifters and VCMs were tracked. Three different deployments of the expendable drifters were made. Each deployment consisted of eight instruments, four surface and four 50 meter drogues. The VCMs were deployed twice. The first 50 hour experiment involved two instruments ballasted to 140 and 90m. The second deployment involved three VCMs ballasted to 150, 95, and 175m. The VCMs were recovered by 2000 on February 25.

During the drifter/VCM tracking, ENDEAVOR and OCEANUS rendezvoused on February 26. Six members of the ENDEAVOR scientific party, came aboard for a meeting to discuss the work completed and plans for the final week and a half.

Joint shipboard work was scheduled for the remainder of the cruises. SeaSoar was again deployed at 2000 on February 26. A diamond shaped pattern enclosing a sharp front was begun, while ENDEAVOR steamed parallel inside the diamond. This survey ran for only six hours, until ENDEAVOR reported that the front had moved farther east. OCEANUS still surveying with the SeaSoar steamed south to box in the mooring array finishing the pattern at 0800 March 1. An RTP section was started, but after three stations was aborted because of rough seas and high winds. Once again the SeaSoar was launched at 1600. During the next 36 hours, the mate reported 15-18 foot seas, and wind gusts to 50 kts with the ship taking 30^{o} rolls while SeaSoar continued an elongated box survey. During this time, ENDEAVOR was hove-to after tow-yoing and microstructure profiling inside the box of OCEANUS' survey.

With the weather improving, an RTP survey was begun on March 4. This survey ran south-southwest to north-northeast. Fourteen stations were completed crossing the front. XBTs were done in conjunction with the RTP survey.

The buoys set during Phase One in the vicinity of 27^{o}N, 70^{o}W telemetered position and meteorological data. One of the buoys F10 had an intermittent problem and infrequently updated its position. Because of the length of time the buoys were to remain on station, this position information was very important for monitoring purposes. The decision was made to borrow a spare ARGOS transmitter from ENDEAVOR, to use on Buoy D in the mooring array. (A third and final rendezvous took place to pass the transmitter over.) On March 6, the OCEANUS returned to the central array to install this duplicate transmitter. While down south in the mooring area, all the buoys were visually checked. SeaSoar was deployed the final time to survey a box around the moorings on March 6. A frontal feature with unique salinity characteristics was mapped. Six CTD stations were taken in the area of the moorings before the ship headed back to Woods Hole. OCEANUS left the FASINEX area on March 9 ending FASINEX Phase Two. The ship returned to Woods Hole on March 12.

b. Schedule Overview

5 February 1986	Depart for Bermuda/ Return to Woods Hole with steering problems
8 February	Depart for Bermuda
11 February	Arrive Bermuda
12 February	Depart St. Georges Bermuda
13 February	Arrive FASINEX area
8 March	Depart FASINEX area
12 March	Arrive Woods Hole

Science Party - Woods Hole to Bermuda

1. Pollard, Raymond, Co-Chief Scientist, IOS
2. Regier, Lloyd, Co-Chief Scientist, SIO
3. Smithers, John, Scientific Officer, IOS
4. Jackson, Christopher, Computer Specialist, NERC
5. Lewis, Derek, Computer Engineer, NERC
6. Potter, Kay, Computer Programmer, NERC
7. Lind, Richard, Research Meteorologist, UW
8. Vaucher, Chris, Technician, NPGS
9. Spencer, Eric, Safety Officer, WHOI

Science Party - FASINEX Phase Two

1. Weller, Robert, Chief Scientist, WHOI
2. Pollard, Raymond, Scientist, IOS
3. Regier, Lloyd, Scientist, SIO
4. Davidson, Ken, Scientist, NPGS
5. Payne, Richard, Research Associate, WHOI
6. Dean, Jerome, Research Specialist, WHOI
7. Pennington, Nancy, Sr. Research Assistant, WHOI
8. Light, Christina, Research Assistant, WHOI
9. Guest, Brian, Research Assistant, WHOI
10. Smithers, John, Scientific officer, IOS
11. Lewis, Derek, Computer Engineer, NERC
12. Dufor, James, Development Engineer, SIO

WHOI	Woods Hole Oceanographic Institution
IOS	Institute of Oceanographic Sciences, England
SIO	Scripps Institution of Oceanography
NPGS	Naval Postgraduate School
UW	University of Washington
NERC	Natural Environment Research Council, England

c. Chronological Log for OCEANUS 175

Feb 05	Depart Woods Hole/Return with Steering Problems		
08	Depart Woods Hole for Bermuda		
11	Arrive St. Georges, Bermuda		
12	Depart St. George's, Bermuda for FASINEX Area		
13	1600 Launch SeaSoar		
14			
15		Transfer equipment to ENDEAVOR Meteorological calibration between ships	
16			
17			
18	Recover SeaSoar 1200 Deploy SeaSoar 1600		
19			
20	Recover SeaSoar 0400 Deploy SCRIPPS Drifters Tracking	Deploy VCMs	
21			
22		Recover/Deploy VCMs	
23			ENDEAVOR Party aboard
24			
25	Deploy SeaSoar 1600	Recover VCMs	
26			
27			
28			
Mar 01	Recover SeaSoar 0400		

cont.

Mar 01	RTP #1-#3 Deploy SeaSoar 1300
02	Recover Seasoar 2130 Deploy SeaSoar 2330
03	
04	Recover SeaSoar 0900 RTP #4-#7
05	RTP #8-#14 ENDEAVOR rendezvous for transmitter
06	Check Buoys D, B, C Install Buoy D transmitter Deploy SeaSoar
07	
08	Recover SeaSoar 0900 CTD Stations #1-#5
09	CTD Station #6 Woods Hole transit
10	
11	
12	Arrive Woods Hole

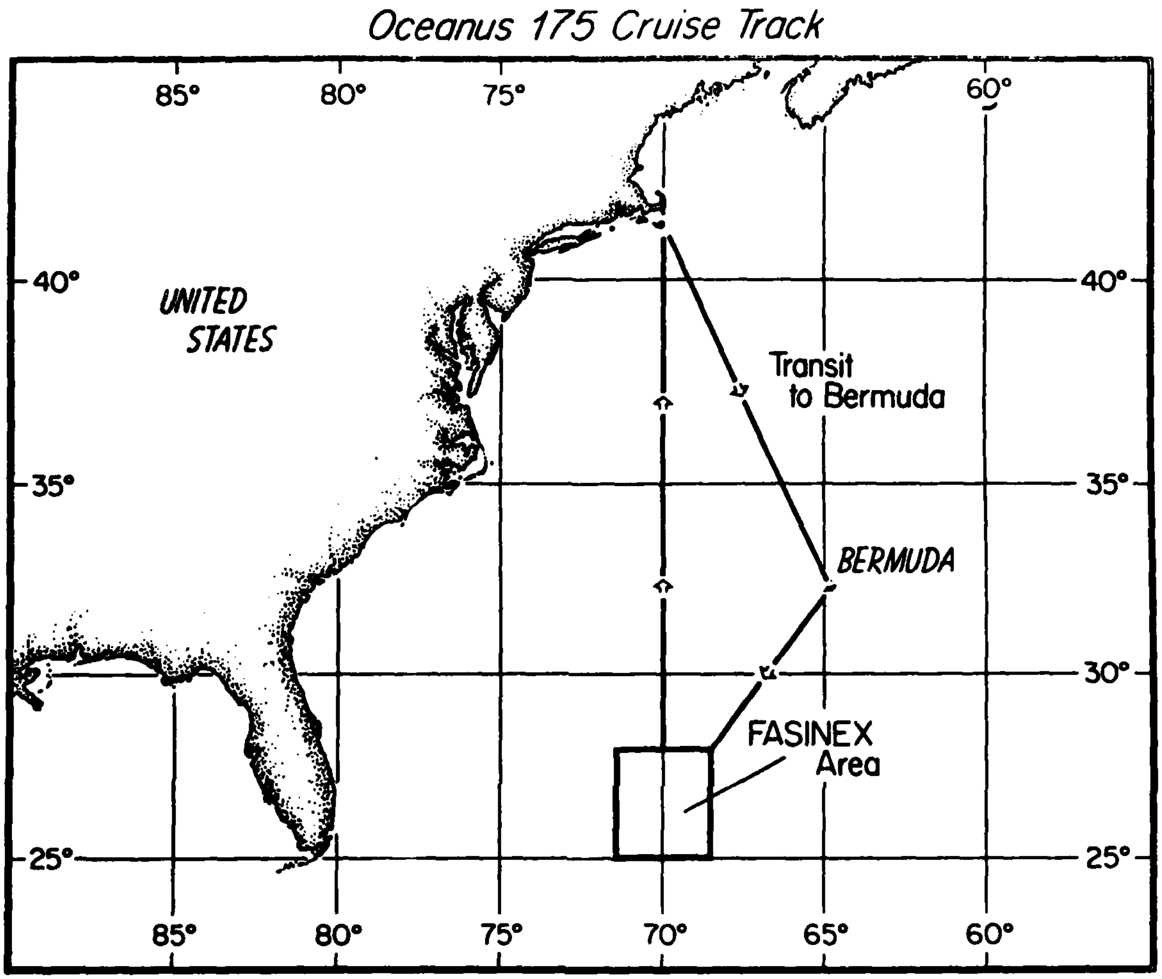


Figure II-1: Cruise track.

III. FASINEX Moored Array

The oceanic front is a three-dimensional feature with temporal as well as spatial variability. In contrast to the aircraft and ship operations, which provided high resolution views over a limited time, the moored array used self-contained surface and subsurface instruments to obtain a longer running view from a small number of fixed locations. Over the 6-month period the fronts moved through the center of the moored array so that moored instruments returned observations from a variety of environments (in the front, out of the front; under various meteorological conditions) as well as during the transition from winter, when the SST jump is large, to summer, when the SST signal associated with the front fades.

The 6-month array was composed of surface moorings and PCM moorings. The longer duration moorings set by Brink in October 1984 were subsurface moorings.

Phases One and Three of FASINEX consisted mainly of mooring work, with some additional survey work. A summary of the mooring cruises, KNORR 119, the deployment cruise and KNORR 123, the recovery cruise is available in another data report, WHOI Technical Report 86-35 (FASINEX Report #13).

The data from the moored array will be presented in a later data report.

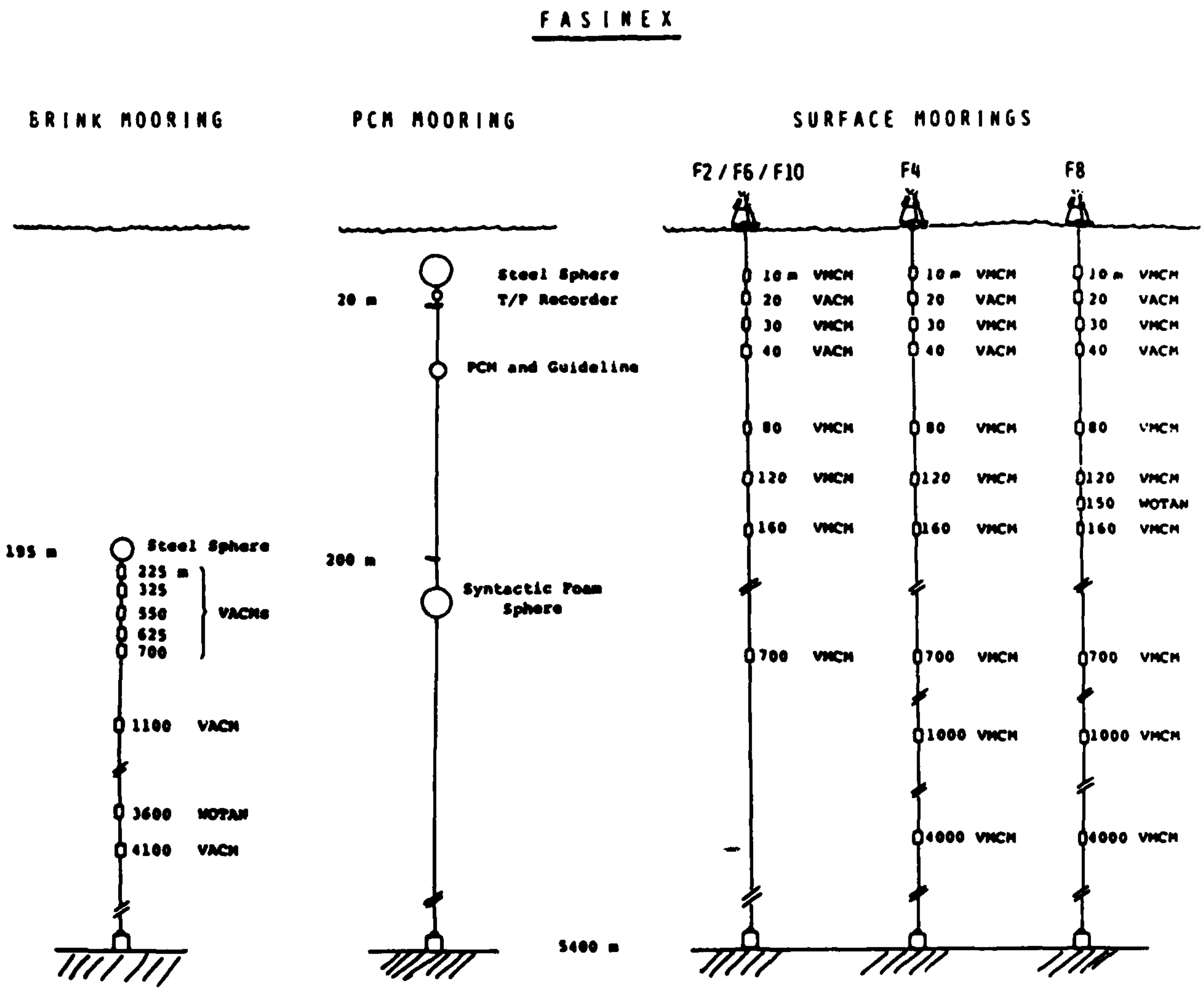


Figure III-1: FASINEX Mooring Schematics.

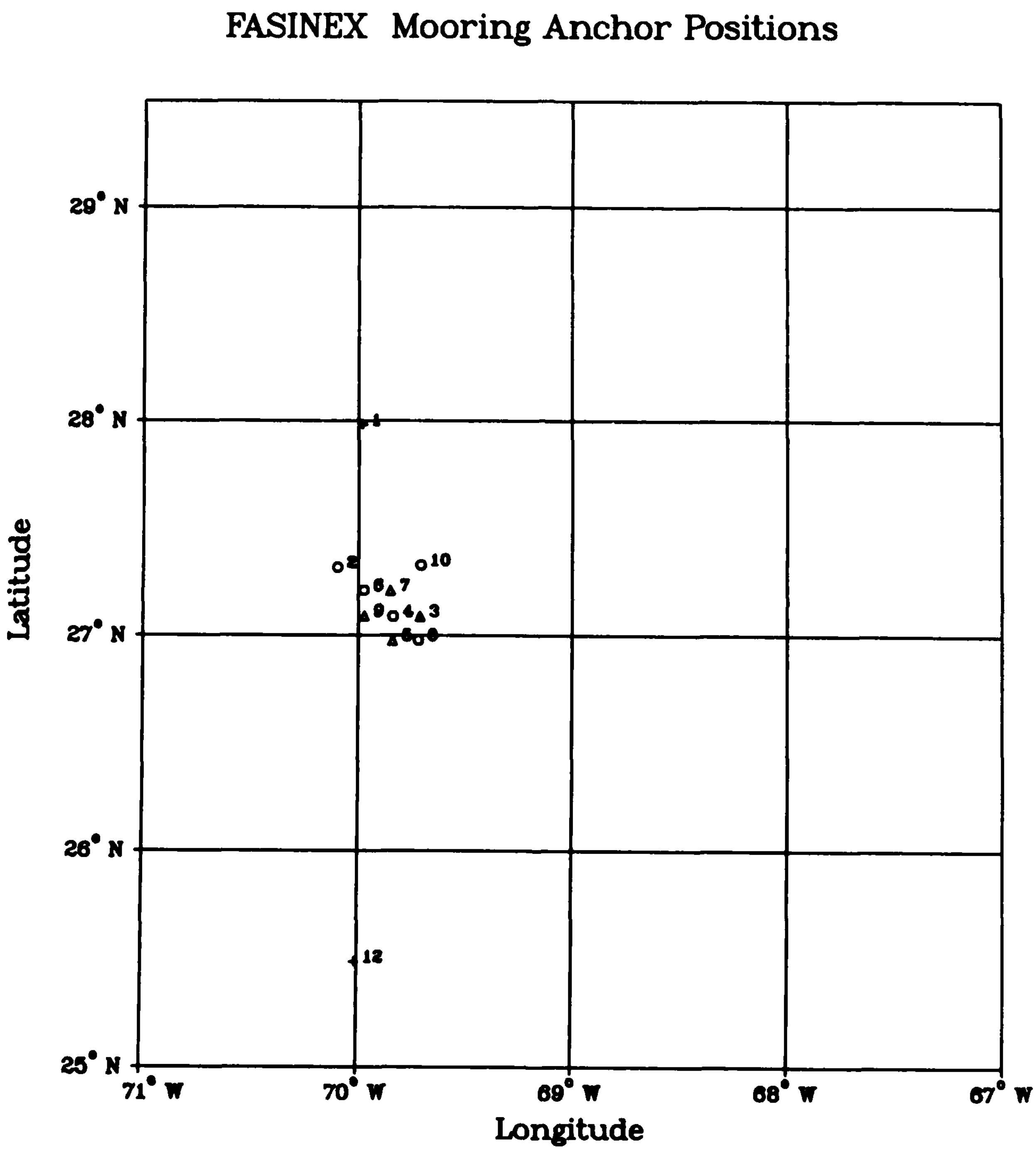


Figure III-2: Anchor Positions of Moorings.

GPS ANCHOR POSITIONS

FASINEX Designation	Visible Identifier	Lat/Lon	WHOI Mooring #
F2	A	27°18.95'N 70°05.86'W	845
F3		27°05.34'N 69°42.75'W	PCM-1
F4	C	27°05.35'N 69°50.30'W	846
F5		26°58.58'N 69°50.40'W	PCM-2
F6	B	27°12.59'N 69°58.48'W	847
F7		27°12.53'N 69°51.03'W	PCM-3
F8	E	26°58.66'N 69°43.19'W	848
F9		27°05.45'N 69°58.33'W	PCM-4
F10	D	27°19.63'N 69°42.52'W	849

Ken Brink's two year subsurface moorings (LORAN C positions)

F1		27°58.90'N 69°58.80'W	829
F12		25°29.10'N 70°00.70'W	830

Table III-1: GPS/LORAN C Positions of Anchors.

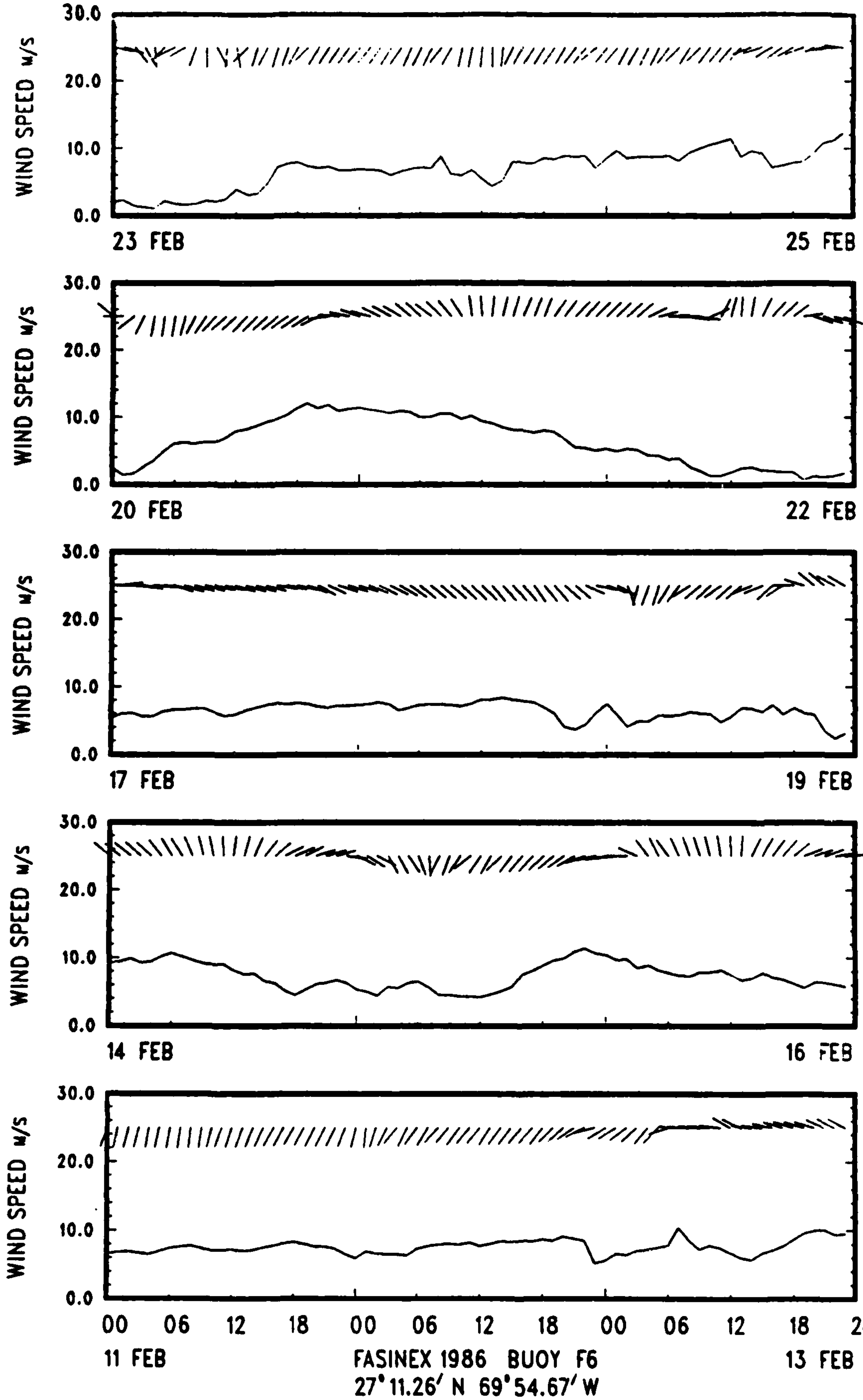


Figure III-3: Phase Two Time Period Wind Data from F6 (Davidson 3-day expanded scale plots).

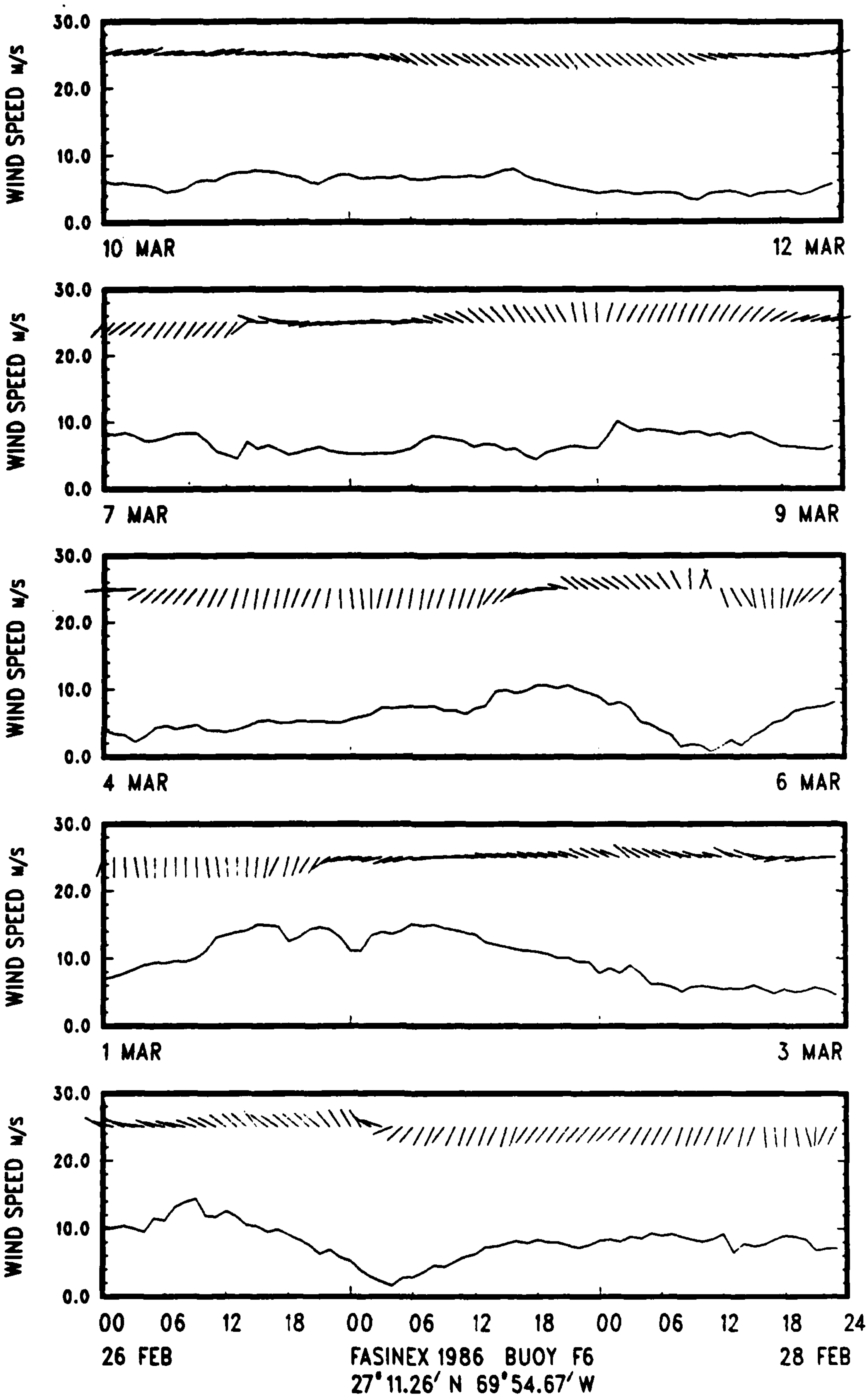


Figure III-3 (Continued)

IV. FASINEX XBT Data

During Phase Two, one XBT section was completed on OCEANUS. The survey was taken in conjunction with the RTP stations which ran from the south to the north crossing the front at approximately 29° 04.09'N 67°53.49'W on March 4-5.

The data were plotted on a strip chart recorder, but due to a malfunction only several profiles were written to a Bathysystem Recorder cassette.

Figure IV-1	Total XBT Pattern
Table IV-1	XBT Time and Position

(See RTP temperature section - XBT/RTP used for data set.)

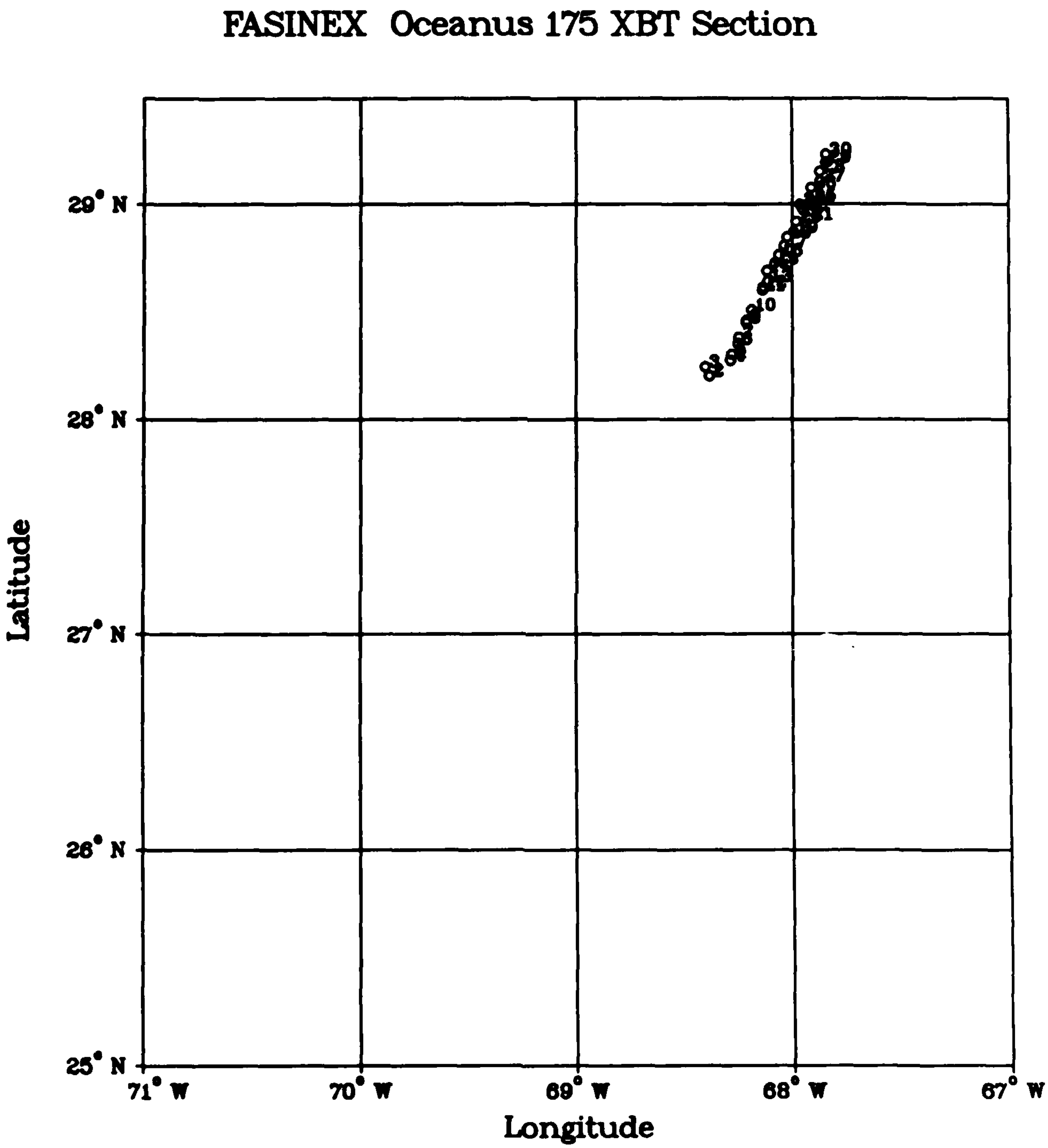


Figure IV-1: Total XBT Pattern.

OCEANUS 175 XBT STATIONS

XBT#	TIME	DAY/MONTH	LATITUDE	LONGITUDE
1	1337	1 Mar	28°12.10	68°23.10
2	1435	1 Mar	28°12.17	68°22.96
3	1508	1 Mar	28°14.68	68°24.15
4	1627	4 Mar	28°16.43	68°17.16
5	1641	4 Mar	28°18.17	68°16.77
6	1825	4 Mar	28°21.19	68°15.00
7	1839	4 Mar	28°22.93	68°14.78
8	2024	4 Mar	28°27.01	68°12.81
9	2030	4 Mar	28°27.63	68°12.78
10	2145	4 Mar	28°30.59	68°11.28
11	0009	5 Mar	28°36.05	68°08.20
12	0015	5 Mar	28°36.89	68°08.06
13	0222	5 Mar	28°38.66	68°06.75
14	0244	5 Mar	28°41.48	68°06.93
15	0440	5 Mar	28°43.52	68°04.85
16	0458	5 Mar	28°45.88	68°03.70
17	0635	5 Mar	28°48.51	68°02.15
18	0651	5 Mar	28°50.84	68°01.39
19	0834	5 Mar	28°52.30	67°59.45
20	0855	5 Mar	28°55.23	67°58.83
21	1114	5 Mar	28°55.83	67°55.29
22	1132	5 Mar	28°58.55	67°57.04
23	1144	5 Mar	29°00.08	67°57.85
24	1333	5 Mar	29°00.18	67°54.77
25	1339	5 Mar	29°00.96	67°54.86
26	1533	5 Mar	29°04.68	67°54.80
27	1700	5 Mar	29°06.56	67°52.28
28	1720	5 Mar	29°09.29	67°52.36
29	1906	5 Mar	29°11.87	67°50.65
30	1922	5 Mar	29°14.11	67°50.56

Table IV-1: XBT Time and Positions.

V. FASINEX Underway Sampling

a. Oceanographic Log

An oceanographic log was recorded at 15 minute intervals on OCEANUS 175 for the 25 days the ship worked in the frontal area. The variables logged were time, LORAN C latitude and longitude, sea surface temperature from buckets (SST), SAIL SST, and towed fish SST. Thermosalinograph temperature was logged along with SeaSoar mixed layer temperature for specific time periods. The LORAN C data were stored to an IBM AT using floppy disks. The SAIL and towed fish data were stored every minute on Apple IIe floppy disks. The underway towed sensor was a modified XBT probe.

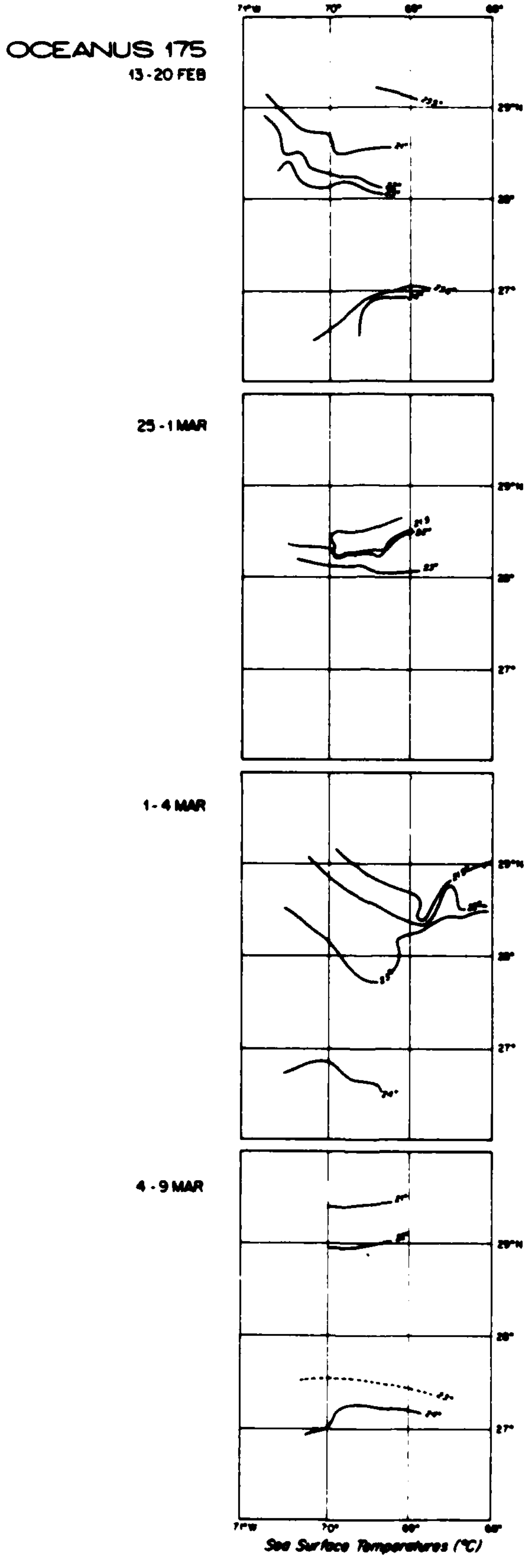


Figure Va-1. Temperature Contours from Bucket Samples.

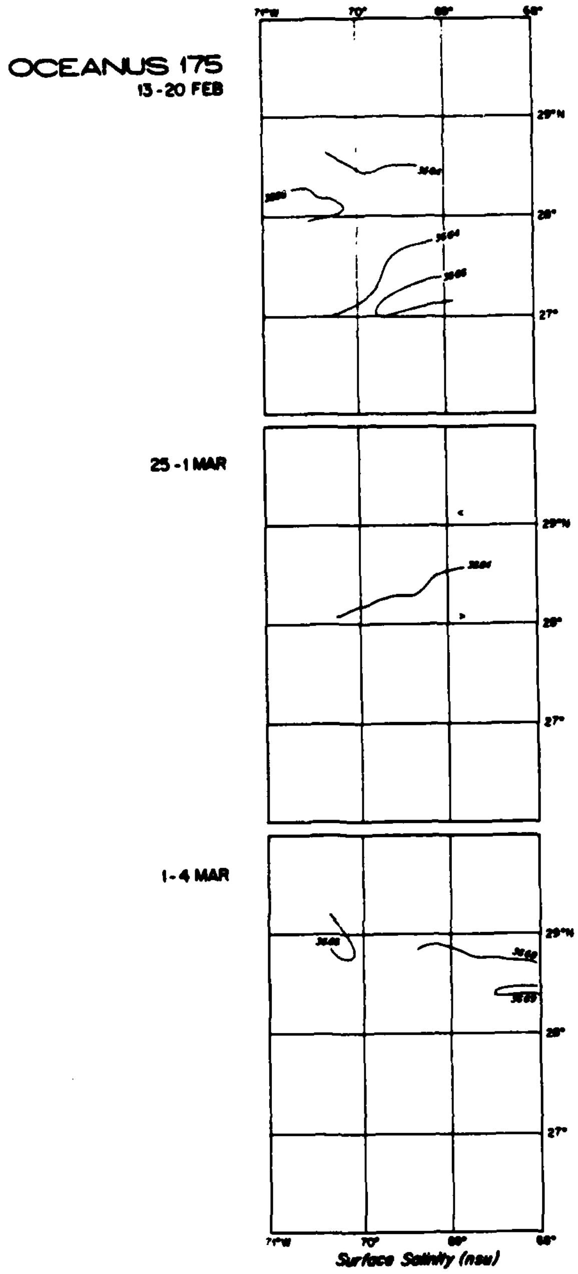


Figure Va-2. Salinity Contours from Bucket Samples

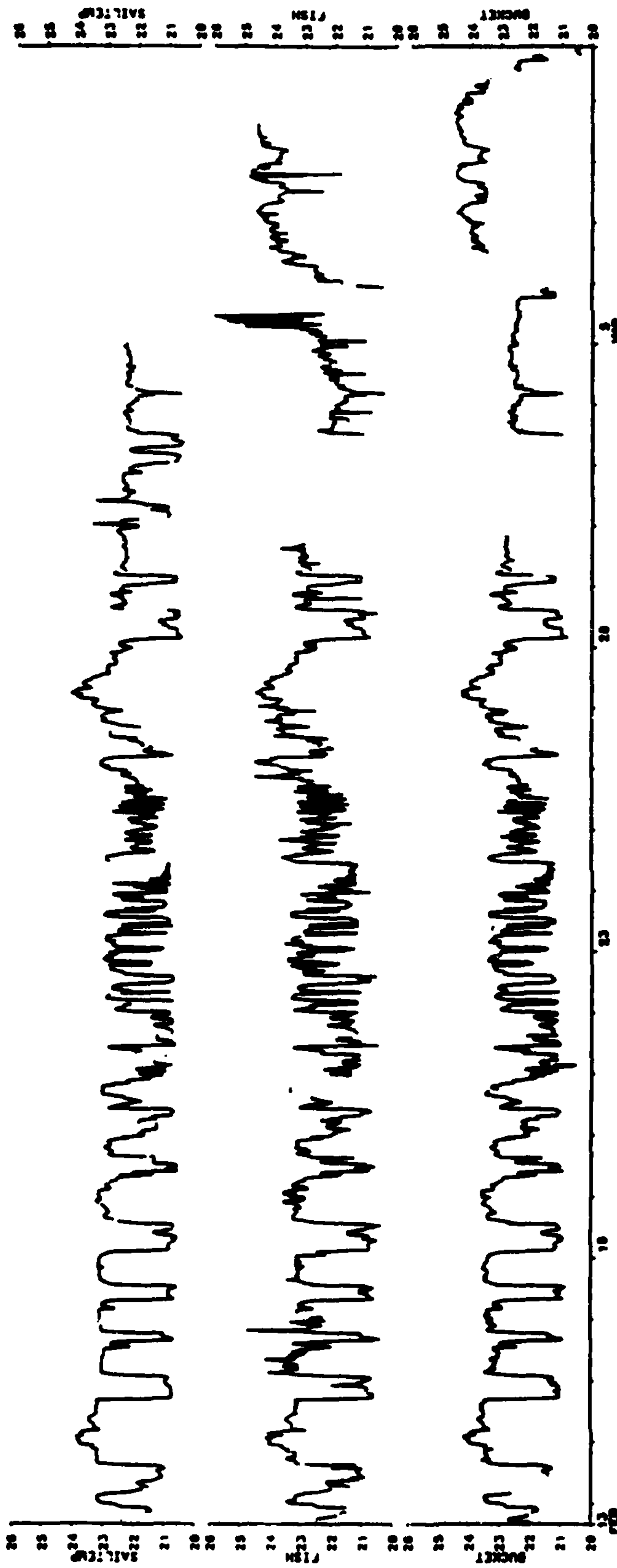


Figure Va-3: Bucket, Towed Fish and SAIL Temperature Comparative Plots.

OCEANUS 175 UNDERWAY LOG

Date	Time	Latitude	Longitude	Fish	Bucket	SAIL	T/S	Mixed Layer Temp	Mixed Layer Time
2/13	1600	30°07.94	67°43.24	-	21.6	26.40			
2/13	1615	30°06.55	67°45.14	-	21.7	26.44			
2/13	1630	30°04.76	67°47.74	-	22.0	26.72			
2/13	1645	30°02.95	67°50.54	-	22.0	26.43			
2/13	1700	30°01.06	67°53.03	22.5	22.0	26.91			
2/13	1715	29°59.11	67°55.79	-	22.0	27.1			
2/13	1730	29°57.24	67°58.53	-	22.5	27.29			
2/13	1745	29°55.37	68°01.07	-	22.6	22.4			
2/13	1800	29°53.58	68°03.84	22.5	22.7	27.6			
2/13	1815	29°51.79	68°06.50	22.5	22.7	27.6			
2/13	1830	29°50.00	68°09.03	22.4	22.6	27.58			
2/13	1845	29°48.20	68°11.91	22.2	22.4	27.29			
2/13	1900	29°46.43	68°14.45	22.1	22.3	27.20			
2/13	1915	29°44.64	68°17.16	22.0	22.2	27.14			
2/13	1930	29°42.78	68°19.89	21.8	22.0	27.04			
2/13	1945	29°40.93	68°22.52	21.9	22.1	27.07			
2/13	2000								
2/13	2015								
2/13	2030	29°35.60	68°30.15	21.7	21.9	26.75			
2/13	2045	29°33.67	68°32.86	21.5	21.9	26.72			
2/13	2100	29°31.80	68°35.34	21.6	21.9	21.65			
2/13	2115	29°30.07	68°37.79	-	21.7	21.43			
2/13	2130	29°28.11	68°40.42	-	21.7	21.46			
2/13	2145	29°26.30	68°42.88	-	21.8	21.46			
2/13	2200	29°24.47	68°45.40	-	21.8	21.56			
2/13	2215	29°22.87	68°48.09	-	21.75	21.53			
2/13	2230	29°21.15	68°50.94	21.5	21.8	21.53			
2/13	2245	29°19.58	68°53.45	21.6	21.9	21.69			
2/13	2300	29°17.88	68°55.87	22.4	22.8	22.41			
2/13	2315	29°17.97	68°56.88	22.5	22.8	22.59			
2/13	2330	29°18.40	68°58.08	22.5	22.8	22.59			
2/13	2345	29°18.87	68°59.22	22.6	22.8	22.66			
2/14	0000	29°18.06	69°00.33	22.6	22.9	22.63			
2/14	0015	29°16.91	69°01.66	23.2	23.0	22.97			
2/14	0030	29°15.78	69°03.04	23.4	23.3	23.12			
2/14	0045	29°14.77	69°04.42	23.4	23.4	23.15			
2/14	0100	29°13.73	69°06.04	23.5	23.4	23.19			
2/14	0115	29°12.63	69°07.71	23.5	23.5	23.22			
2/14	0130	29°11.55	69°09.43	23.2	23.4	23.25			
2/14	0145	29°10.50	69°11.13	23.2	23.4	23.22			
2/14	0200	29°09.43	69°12.81	23.2	23.4	23.25			
2/14	0215	29°08.40	69°14.58	23.2	23.5	23.25			
2/14	0230	29°07.40	69°16.36	23.2	23.5	23.25			
2/14	0245	29°06.34	69°18.00	23.2	23.5	23.25			
2/14	0300	29°05.33	69°19.76	23.2	23.5	23.25			
2/14	0315	29°04.31	69°21.76	23.2	23.4	23.22			
2/14	0345	29°04.57	69°23.99	23.1	23.2	23.09			

Table Va-1: Example of 15 Minute Oceanographic Log.

V. FASINEX Underway Sampling

b. Meteorological Log

Ken Davidson coordinated a met program on both OCEANUS and ENDEAVOR during FASINEX Phase Two. Using met sensors mounted on a bow mast, data were gathered and logged to floppies. Manual observations were also taken every half hour. Radiosondes were launched from both ships alternating on a four hour schedule, with several additional radiosondes launched on aircraft overflight days. SODAR data was also collected on the two ships. The plots included in this section are for both ships. Each three-day data section shows synoptic weather maps with wind arrow, OCEANUS variables, ENDEAVOR variables, joint radiosonde locations and radiosonde data.

Davidson Description of Measurements

1. Due to system failure/performance the following measurements <u>were not made</u> , except for short periods at the beginning, on the ENDEAVOR
   Aerosol
   Humidity variance (Lyman-α)
   SODAR

2. Temperature and humidity on the OCEANUS will only be available from point measurements every 1/2 hour. The SAIL system was judged to be in error for both of these.

3. OCEANUS relative wind direction at 5 minute intervals will be available from the SAIL System when the relative wind was from 300 clockwise to 060. Otherwise, relative wind direction will be obtained from point measurements every 1/2 hour.

4. The OCEANUS SODAR operated throughout except for 36 hours due to enclosure damage. However, its range did not extend to the inversion that was above 1 km. Hence the OCEANUS SODAR will not yield much information of continuous evaluation of inversion.

Dick Payne was in charge of an hourly meteorological log on OCEANUS 175. The variables logged were time, LORAN C latitude and longitude, wind speed and direction, wet and dry bulb temperatures, barometric pressure, wave height and direction, cloud cover and type.

Participant Summary:

K. B. Katsaros and R. J. Lind ,
University of Washington Field Program Summary

Our objective was to measure surface radiation fluxes from R/V ENDEAVOR and R/V OCEANUS during Phase Two of FASINEX. It is hoped that these data will allow analysis of the radiation balance and associated feedback mechanisms at work across the oceanic front.

Identical sensors were deployed on ENDEAVOR and OCEANUS. These included: an Eppley Precison Spectral Pyranometer (model PSP) measuring shortwave irradiance in the frequency band from 0.28 to 2.8 micrometers, an Eppley (model PSP) pyranometer measuring shortwave irradiance in the frequency band from 0.7 to 2.8 micrometers and an Eppley Precision Infrared Radiometer (model PIR) measuring longwave irradiance in the frequency band from 3.0 to 50 micrometers.

Sensors on ENDEAVOR were gimbal mounted on top of a WHOI cargo container located on the port side between midship and the stern. Exposure was excellent with only the ship's mast obstructing the skyward hemisphere at a distance of 15 meters. Continuous monitoring by NPS personnel assured proper cleaning and reported that the sensors were maintained at, or very near horizontal in all sea conditions. Data recording of sensor output was continuous during Phase Two of FASINEX.

Sensors on OCEANUS were fix mounted on top of a bow mast. Exposure was excellent except for the close proximity of a wind sensor also mounted on top of the mast. Our intent was to gimbal mount the sensors, but the accelerations at the tip of the mast were too large to use our simple gravity system. Sensors were cleaned whenever the mast was lowered. A set of four photocells with different diffusers and filters were deployed to compare with the Eppley PSP measuring shortwave irradiance in the 0.7 to 2.8 micrometer wavelength band. Work is beginning on development of an algorithm to remotely determine cloud liquid water content from the combined measurements of shortwave irradiance and photocells (DeVault and Katsaros, 1983). The recording system experienced some data losses during the cruise. Data gaps appear on Feb. 11,12,13,14,16,23,26, and Mar. 1,2,3. Where required, data from models (verified on data from the rest of FASINEX) will make the data set from OCEANUS complete.

Our data from FASINEX is now being processed and results, except for model interpolation, should be ready in August. Data will be in the form of hourly and daily averages. These data will include measured shortwave and longwave irradiance and calculations of shortwave exitance (by method outlines in Payne, 1972) and longwave exitance (from measurements of sea surface temperature).

The investigators wish to thank all of the participants for their cooperation and accommodation during the field phase of FASINEX.

References:

DeVault, J.E. and K. B. Katsaros, 1983: Remote determination of cloud liquid water path from bandwidth limited shortwave measurements. J. Atmos. Sci., 40, 655-685.

Lind, R.J. and K. B. Katsaros, 1982: A model of longwave irradiance for use with surface observations. J. Appl. Met., 21, 1015-1023.

Payne, R. E., 1972: Albedo of the sea surface. J. Atmos. Sci., 29, 959-970.

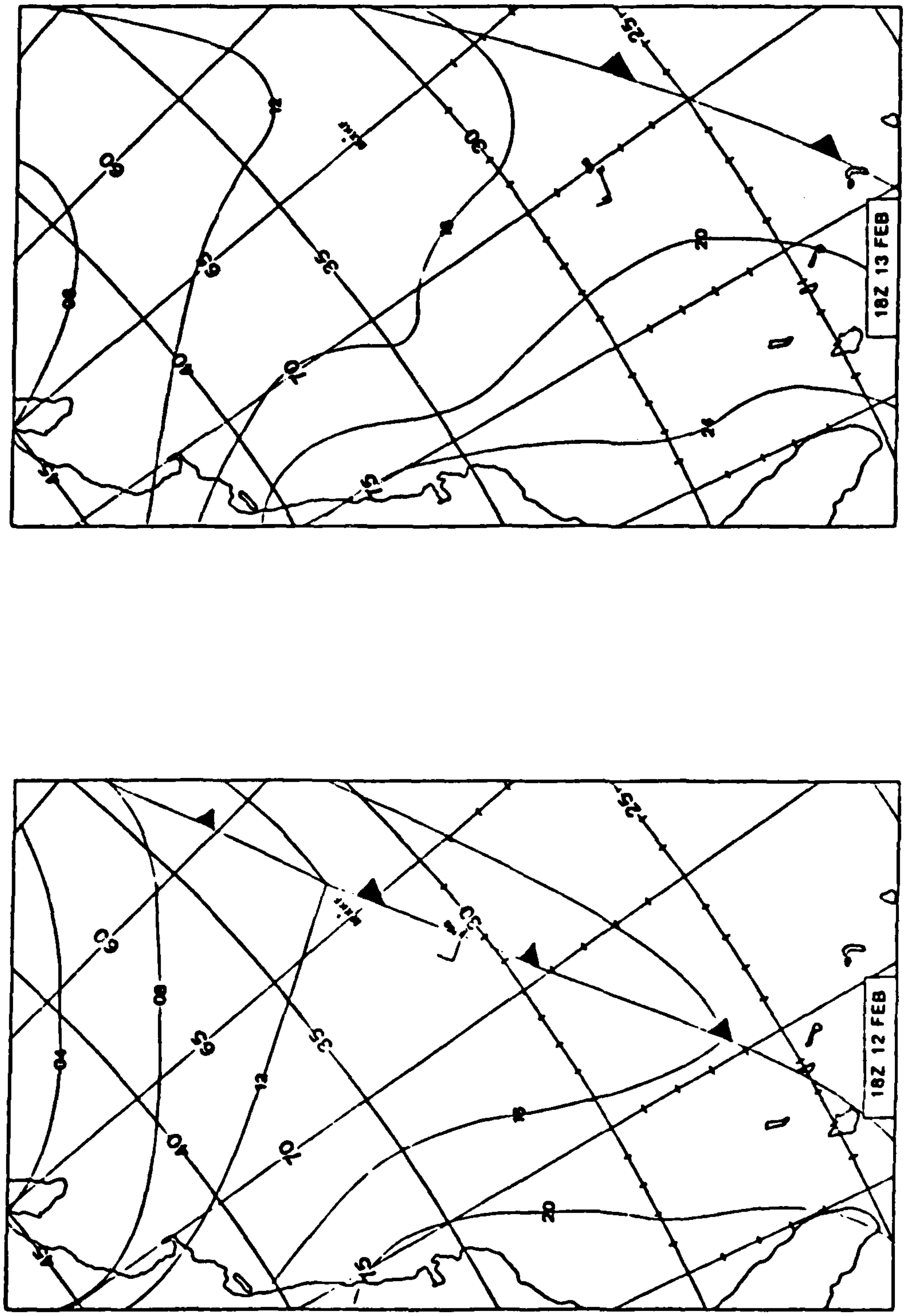


Figure Vb-1: Davidson 3-Day Expanded Meteorological Plots from Payne's Data to Match KNORR Data Set (see WHOI Report 86-35, FASINEX Report #13).

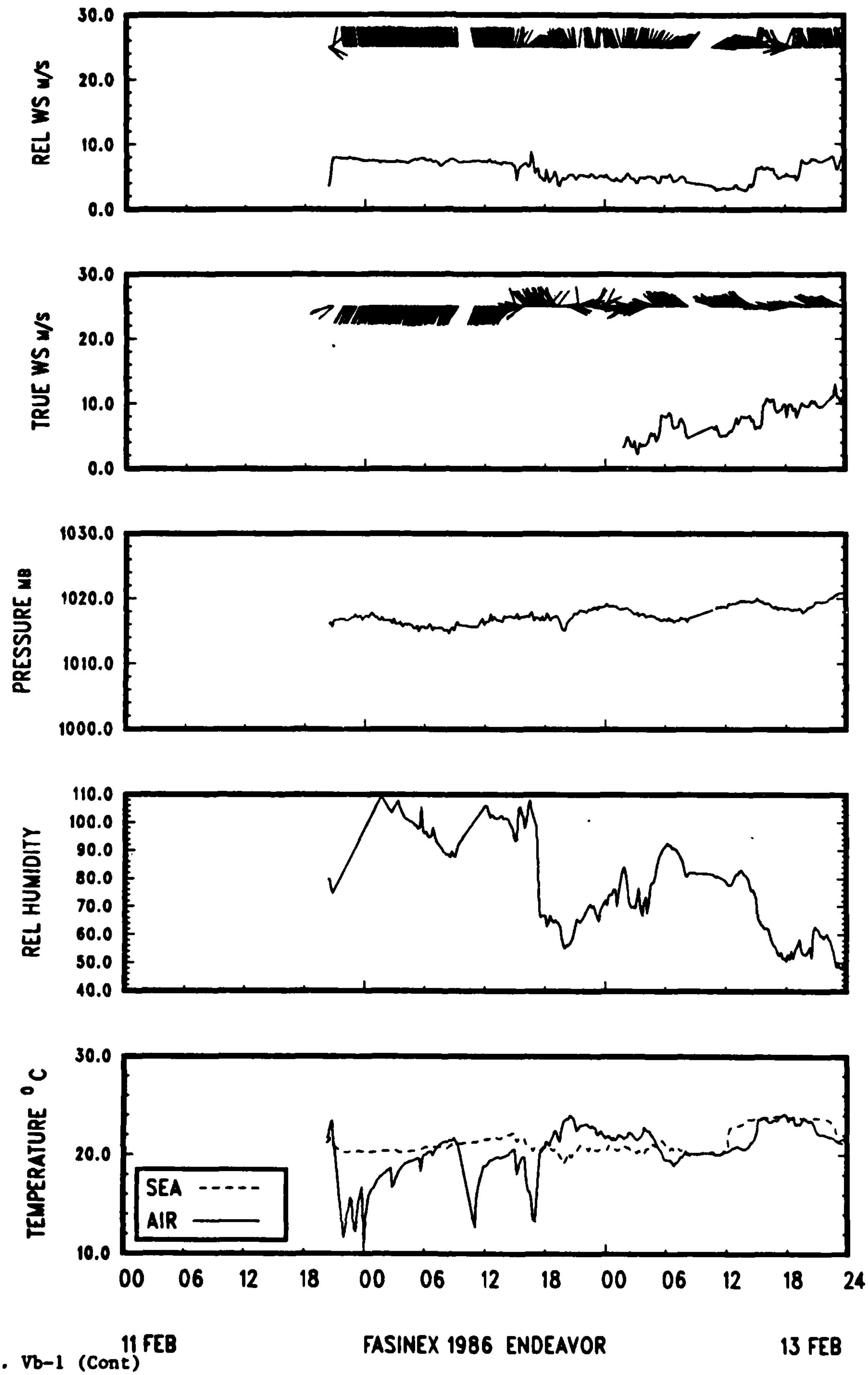

30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
11 FEB
FASINEX 1986 ENDEAVOR
13 FEB

Fig. Vb-1 (Cont)

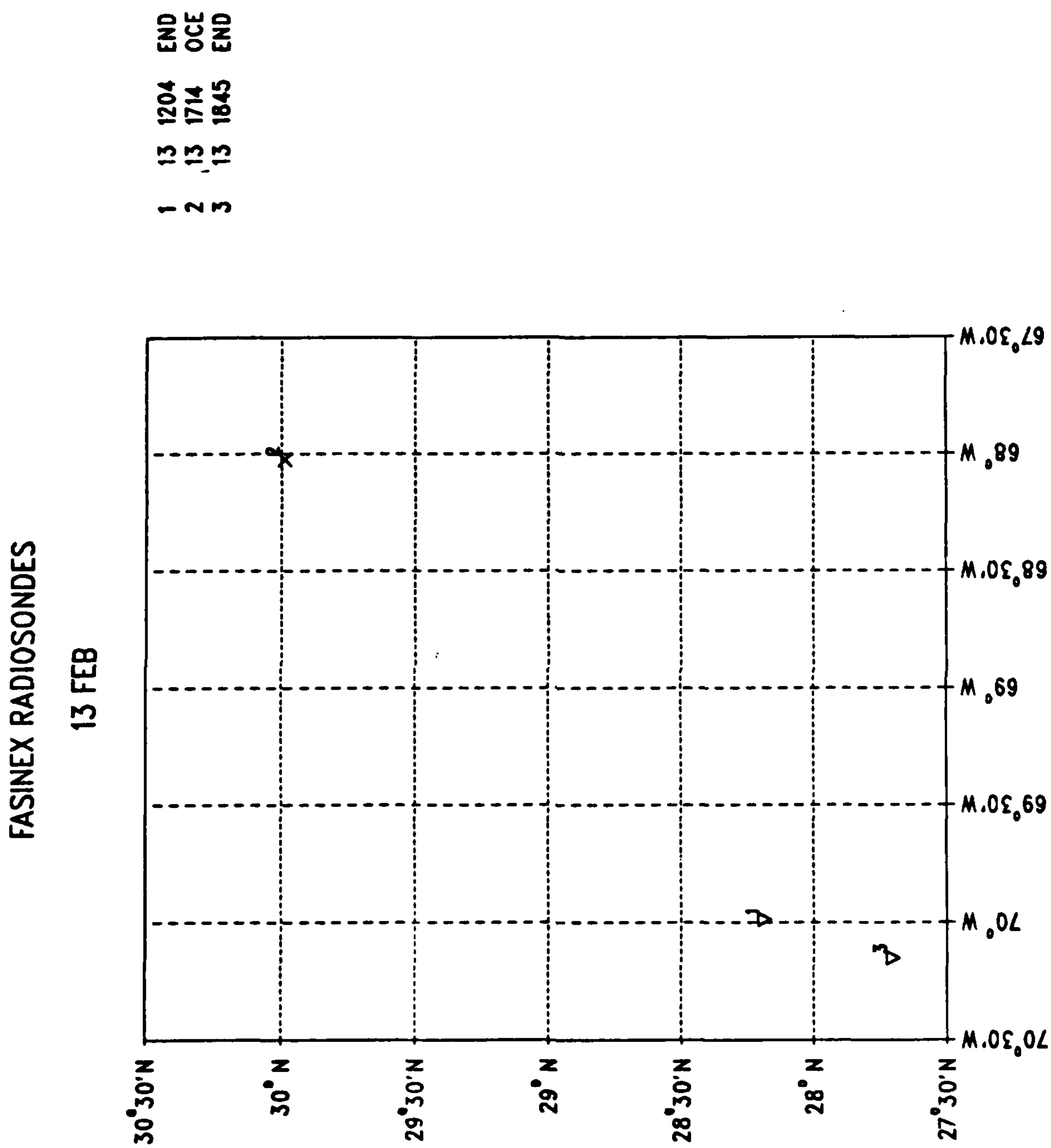

FASINEX RADIOSONDES
13 FEB
1 13 1204 END
2 13 1714 OCE
3 13 1845 END
30°30'N
30°N
29°30'N
29°N
28°30'N
28°N
27°30'N
67°30'W
68°W
68°30'W
69°W
69°30'W
70°W
70°30'W

Fig Vb-1 (Cont)

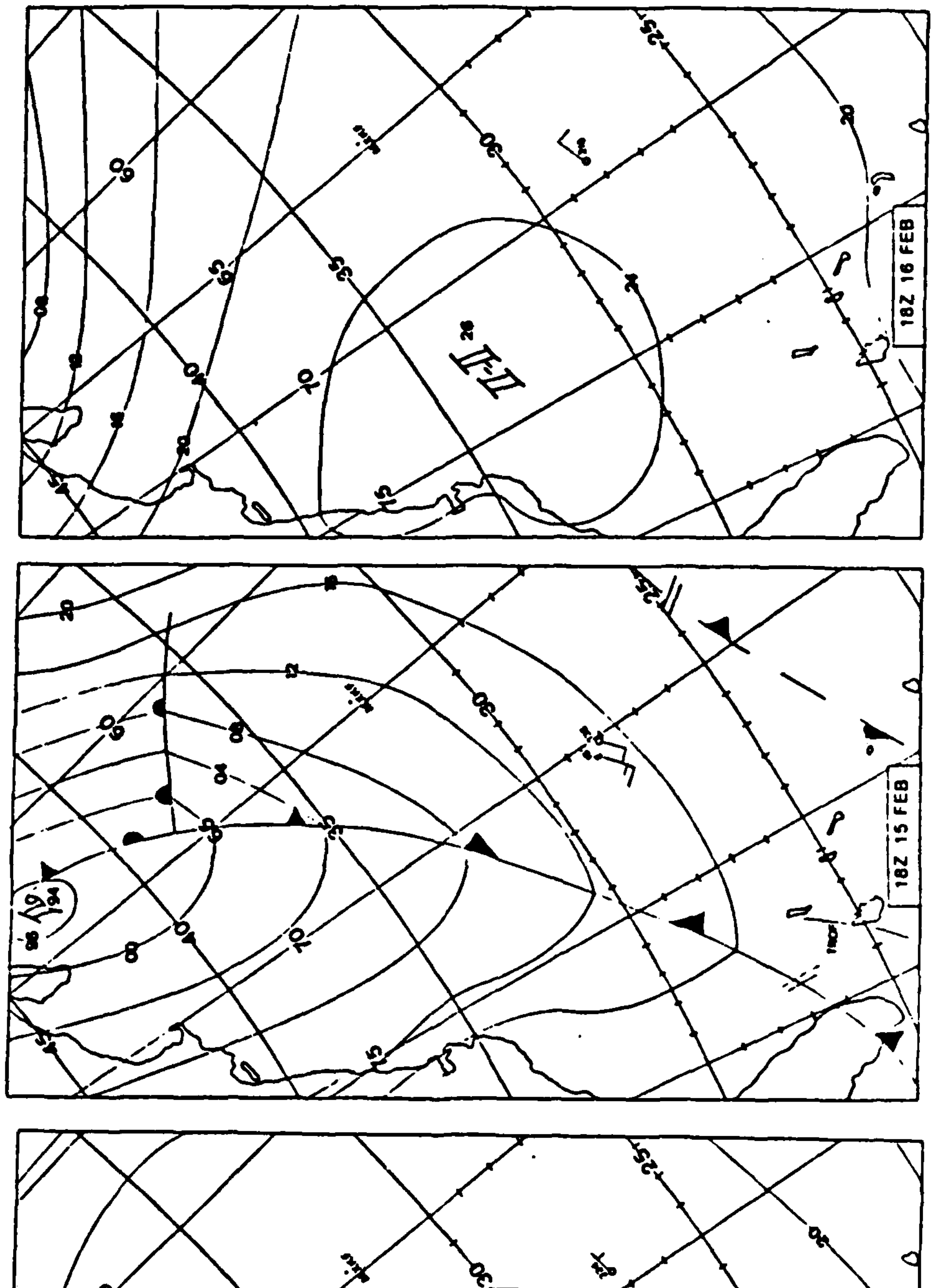
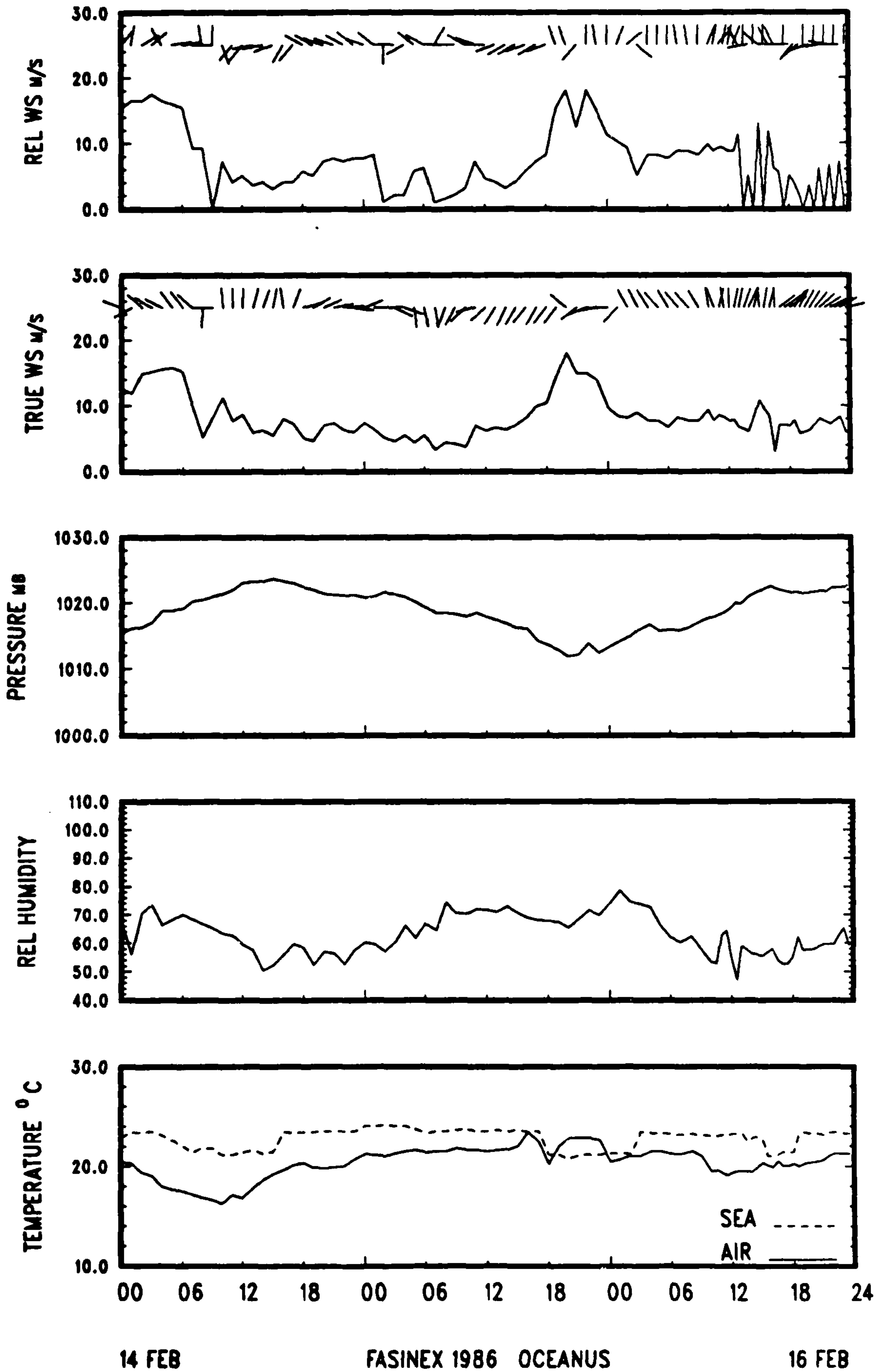


Fig Vb-1 (Cont)



REL WS M/S
TRUE WS M/S
PRESSURE MB
REL HUMIDITY
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
14 FEB
FASINEX 1986 OCEANUS
16 FEB

Fig Vb-1 (Cont)

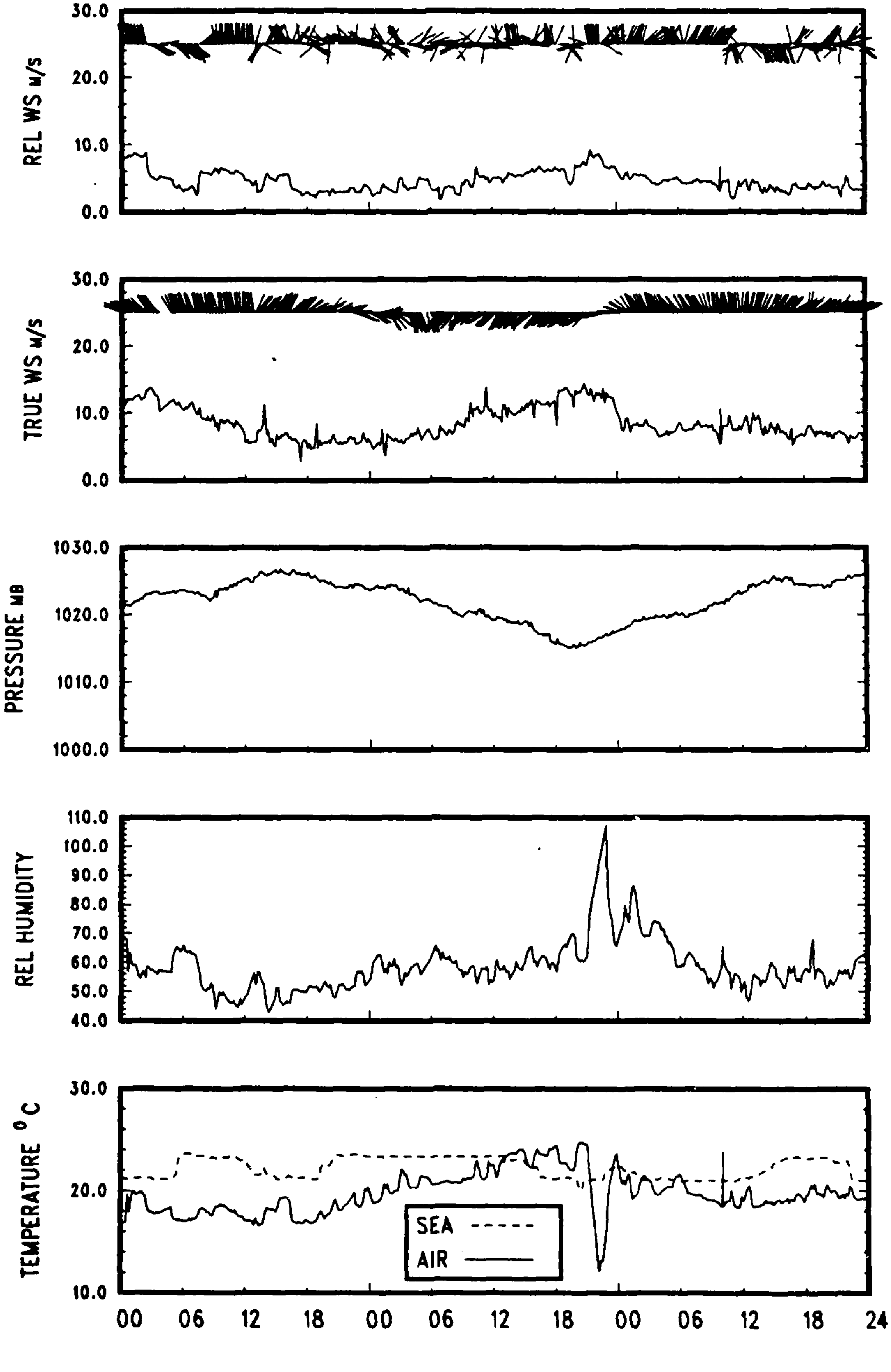
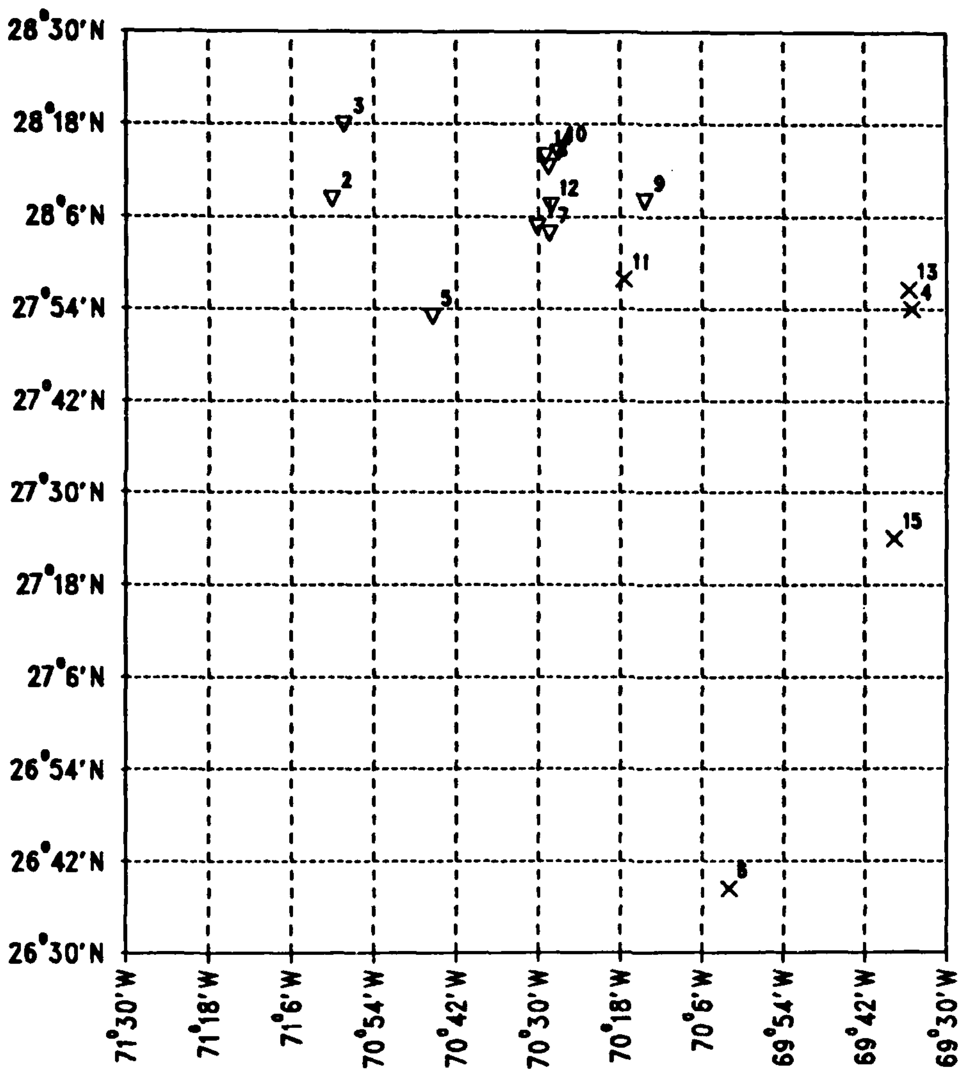

30.0
20.0
10.0
0.0
REL WS m/s
30.0
20.0
10.0
0.0
TRUE WS m/s
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
14 FEB
FASINEX 1986 ENDEAVOR
16 FEB

Fig Vb-1 (Cont)

FASINEX RADIOSONDES

14 FEB – 16 FEB



1	14	18	END
2	14	1245	END
3	14	1500	END
4	14	1502	OCE
5	14	2345	END
6	15	545	OCE
7	15	1207	END
8	15	1800	END
9	16	43	END
10	16	603	END
11	16	731	OCE
12	16	1259	END
13	16	1933	OCE
14	16	2358	END
15	16	2358	OCE

Fig Vb-1 (Cont)

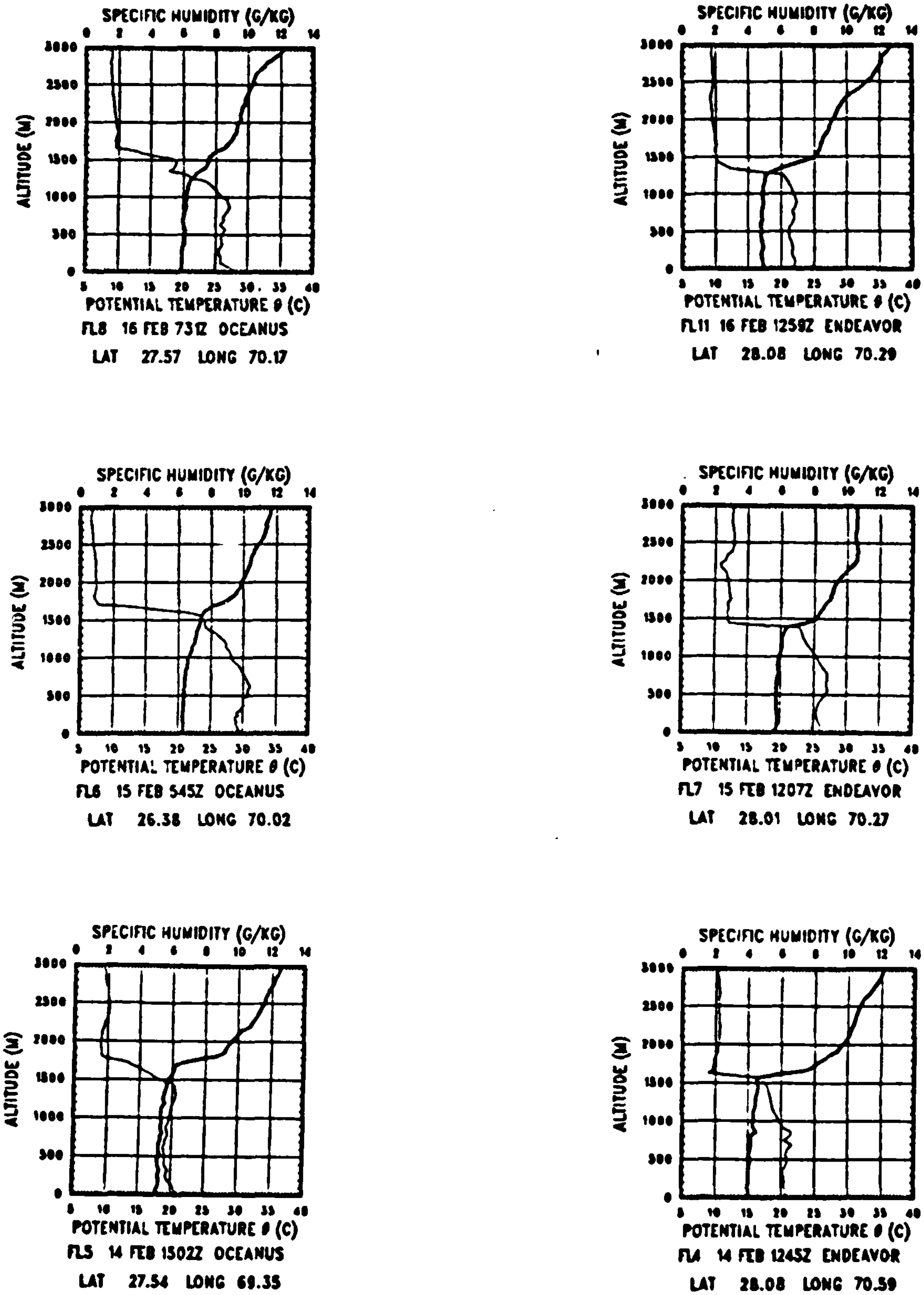

SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL8 16 FEB 731Z OCEANUS
LAT 27.57 LONG 70.17
SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL11 16 FEB 1259Z ENDEAVOR
LAT 28.08 LONG 70.29
SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL6 15 FEB 545Z OCEANUS
LAT 26.38 LONG 70.02
SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL7 15 FEB 1207Z ENDEAVOR
LAT 28.01 LONG 70.27
SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL5 14 FEB 1502Z OCEANUS
LAT 27.54 LONG 69.35
SPECIFIC HUMIDITY (G/KG)
ALTITUDE (M)
POTENTIAL TEMPERATURE θ (C)
FL4 14 FEB 1245Z ENDEAVOR
LAT 28.08 LONG 70.59

Fig Vb-1 (Cont)

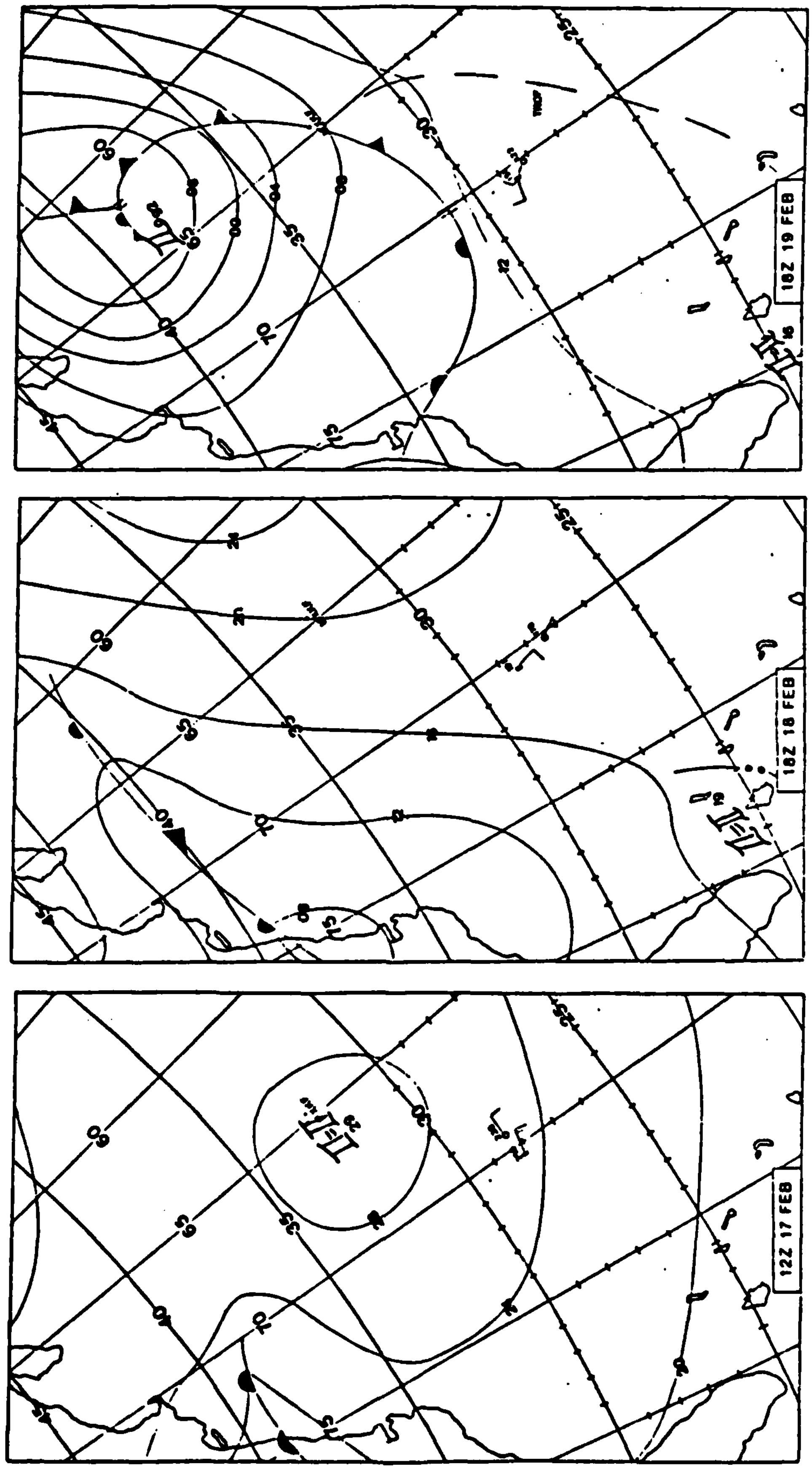


Fig Vb-1 (Cont)

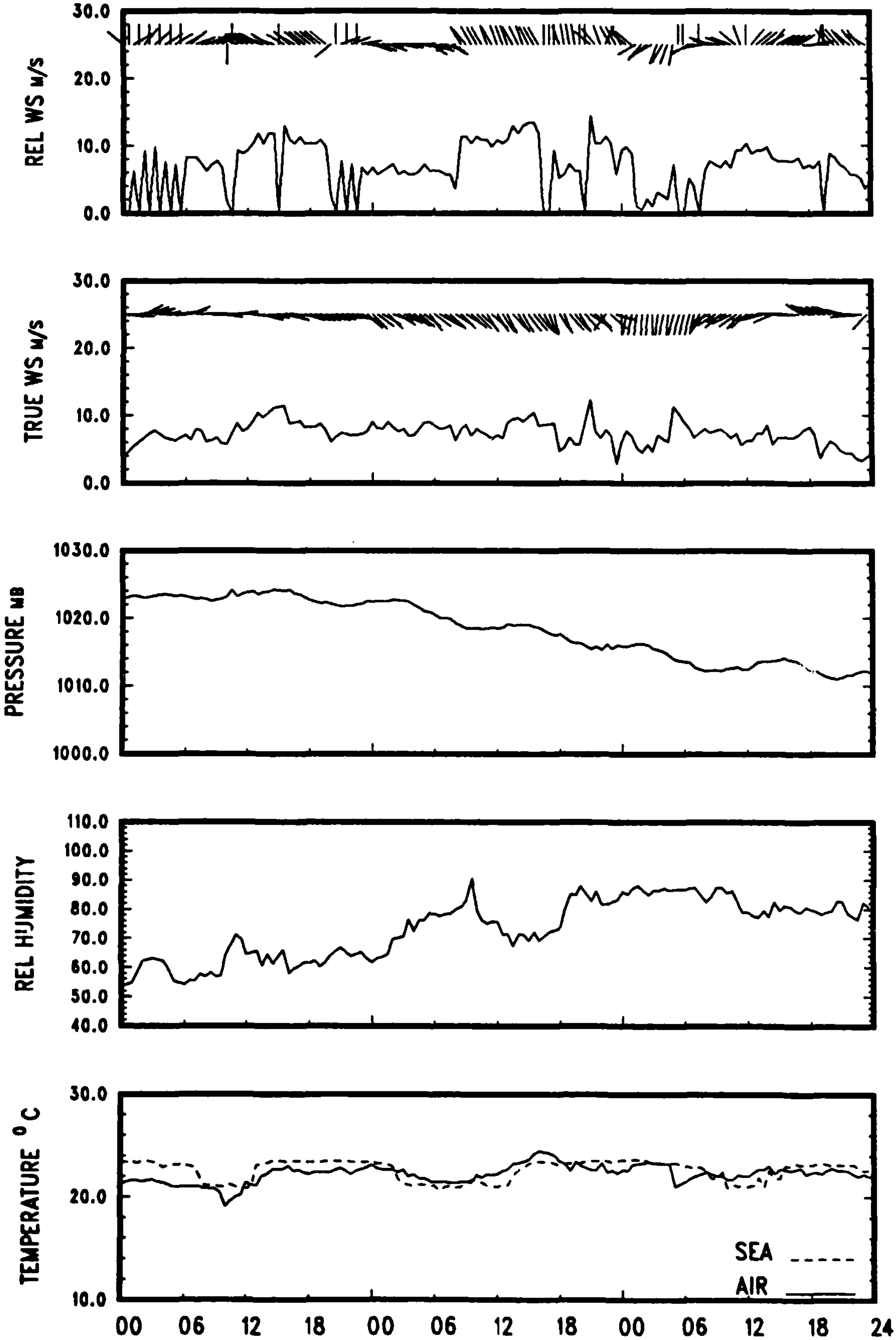


Fig Vb-1 (Cont) 17 FEB FASINEX 1986 OCEANUS 19 FEB

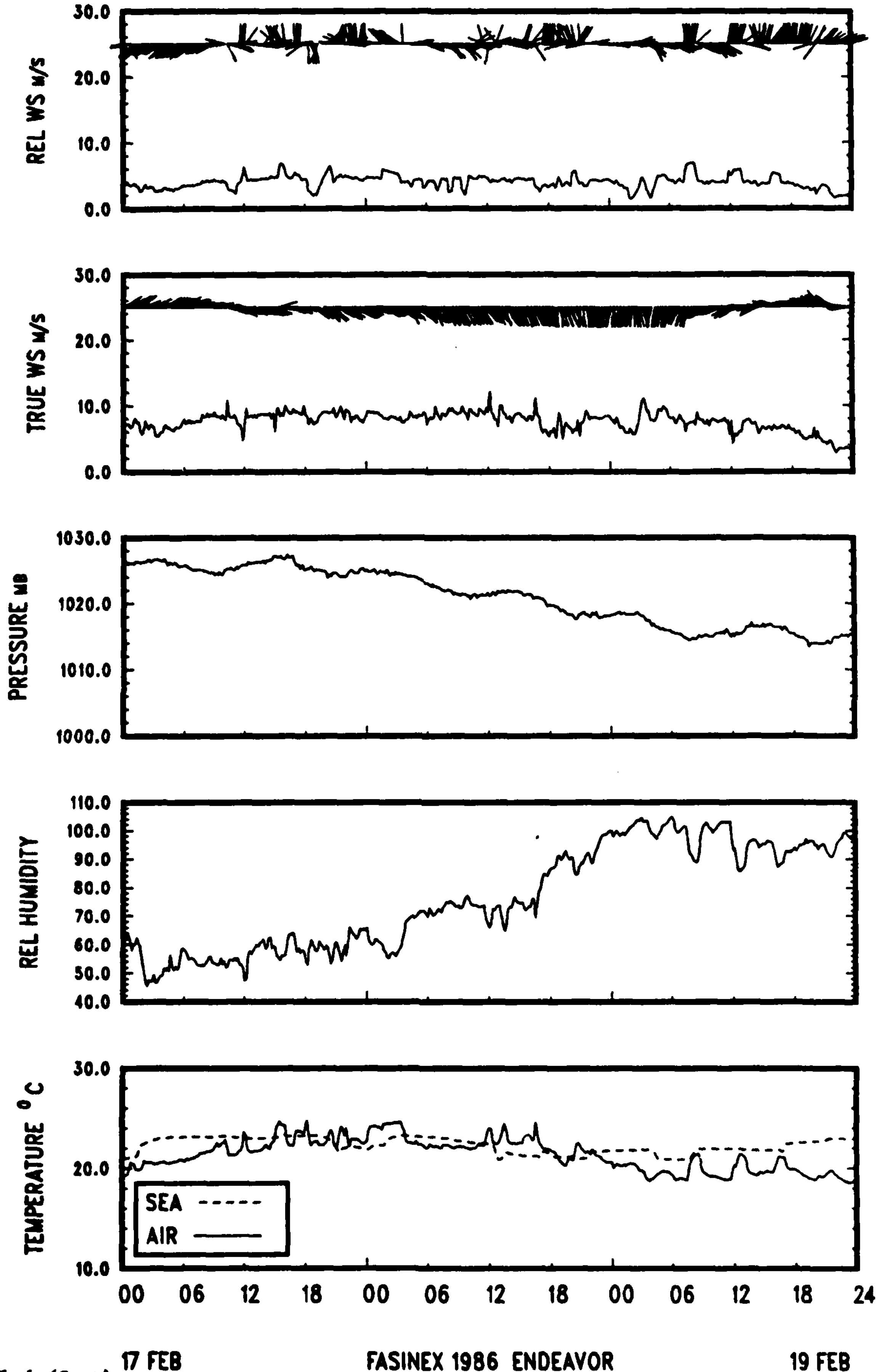
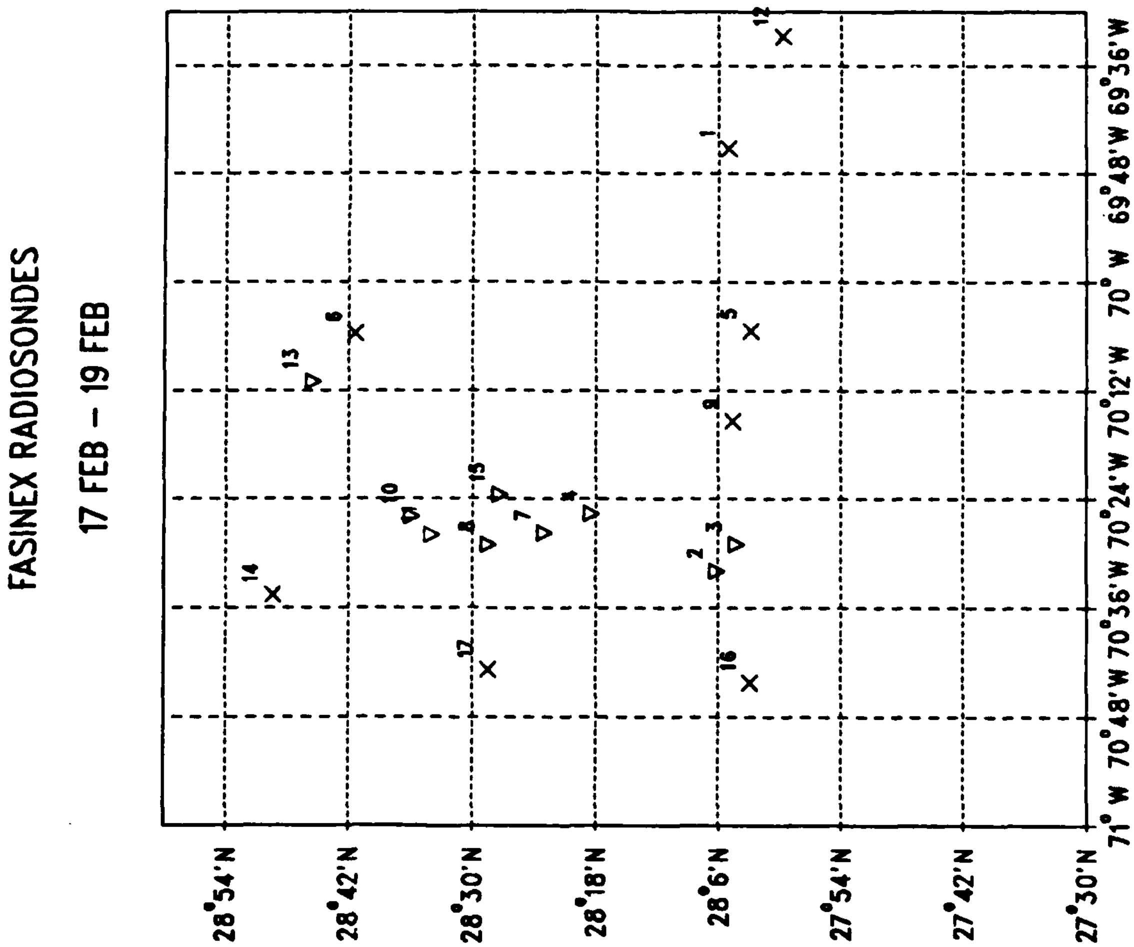
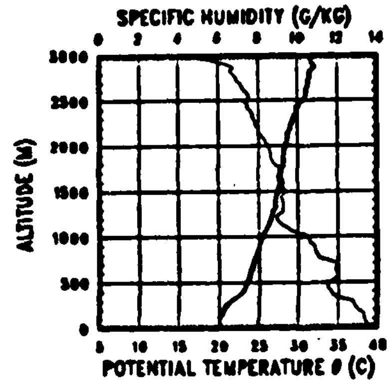

30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
17 FEB
FASINEX 1986 ENDEAVOR
19 FEB

Fig Vb-1 (Cont)

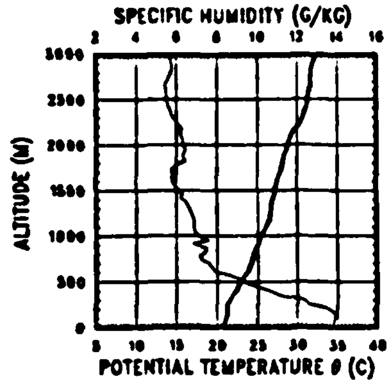


1	17	607	OCE
2	17	1213	END
3	17	1804	END
4	17	2352	END
5	18	49	OCE
6	18	548	OCE
7	18	1200	END
8	18	1459	END
9	18	1521	OCE
10	18	1826	END
11	19	0	END
12	19	603	OCE
13	19	1200	END
14	19	1215	OCE
15	19	1757	END
16	19	2027	OCE
17	19	2334	OCE

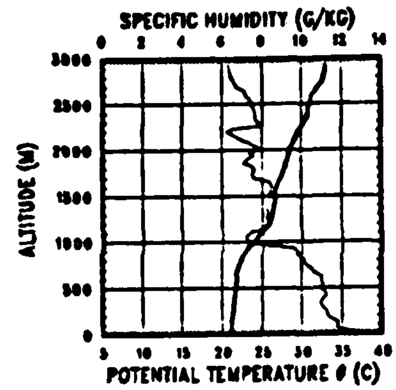
Fig Vb-1 (Cont)



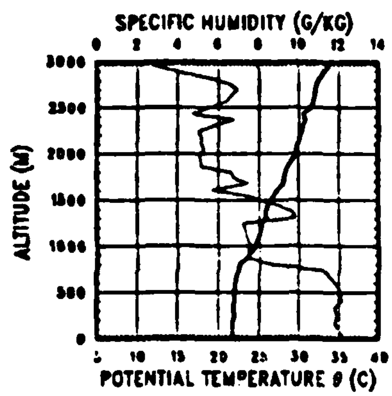
FL24 19 FEB 603Z OCEANUS
LAT 27.59 LONG 69.32



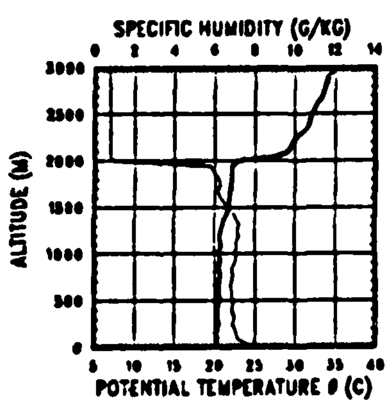
FL20 19 FEB 1200Z ENDEAVOR
LAT 28.47 LONG 70.11



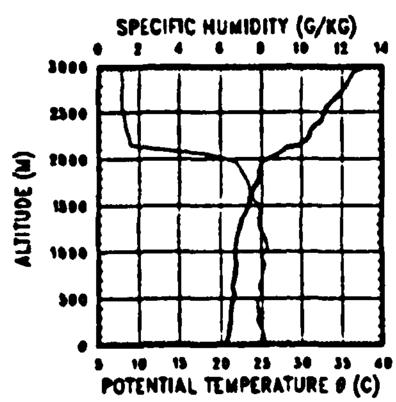
FL15 18 FEB 548Z OCEANUS
LAT 28.41 LONG 70.05



FL16 18 FEB 1200Z ENDEAVOR
LAT 28.23 LONG 70.27



FL11 17 FEB 607Z OCEANUS
LAT 28.05 LONG 69.45



FL13 17 FEB 1213Z ENDEAVOR
LAT 28.08 LONG 70.36

Fig Vb-1 (Cont)

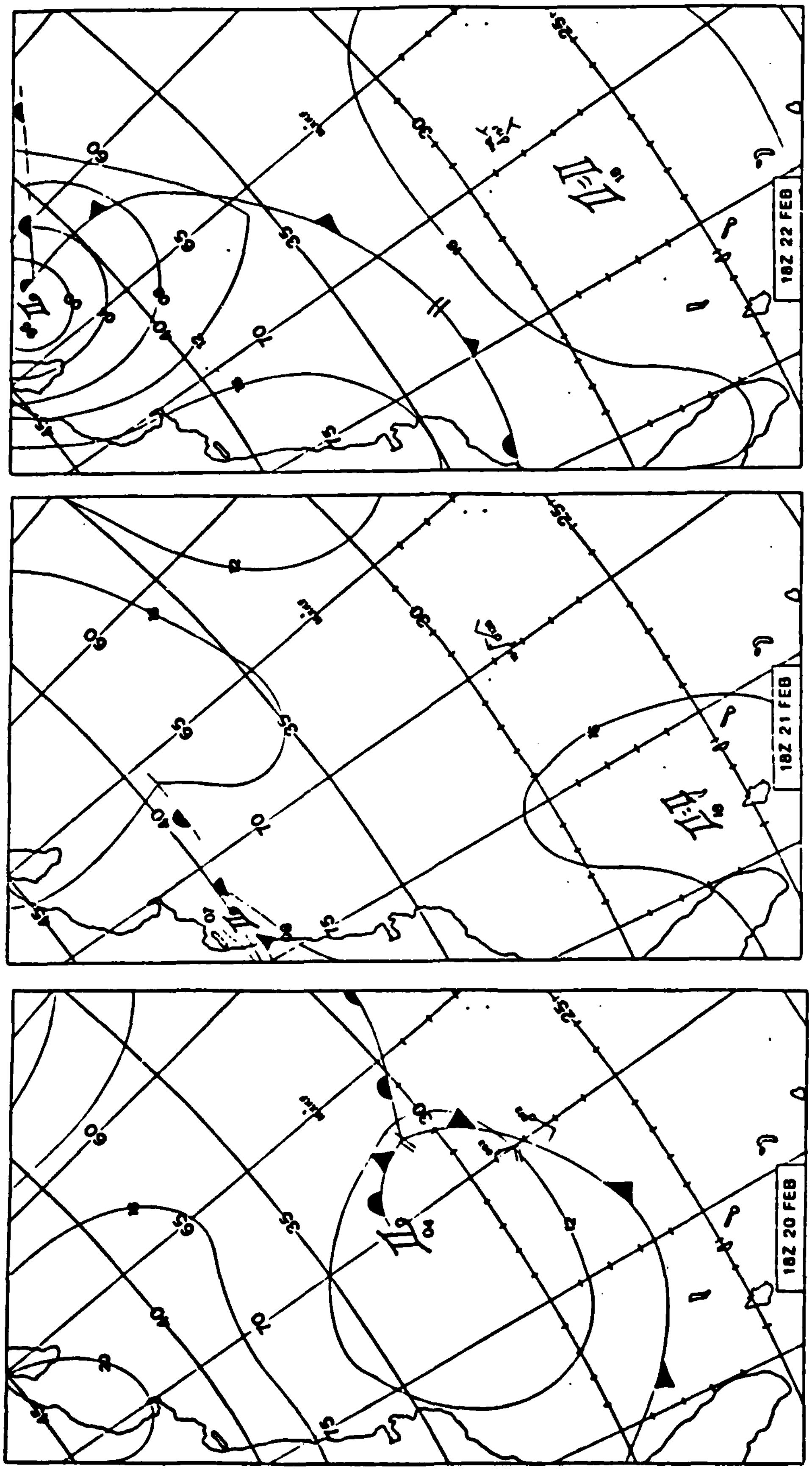


Fig Vb-1 (Cont)

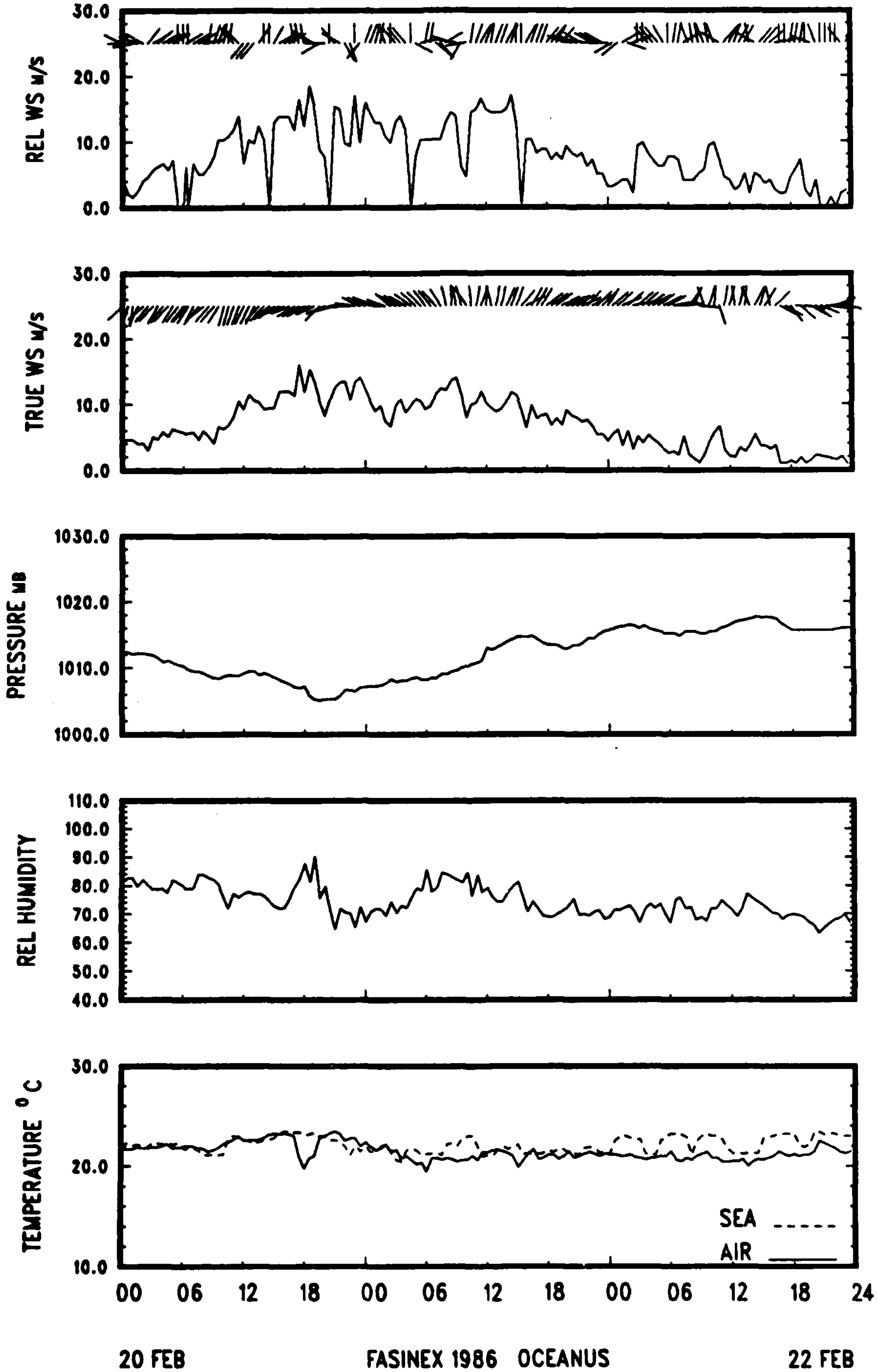

REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
30.0
20.0
10.0
0.0
PRESSURE MB
1030.0
1020.0
1010.0
1000.0
REL HUMIDITY
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
TEMPERATURE °C
30.0
20.0
10.0
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
20 FEB
FASINEX 1986 OCEANUS
22 FEB

Fig Vb-1 (Cont)

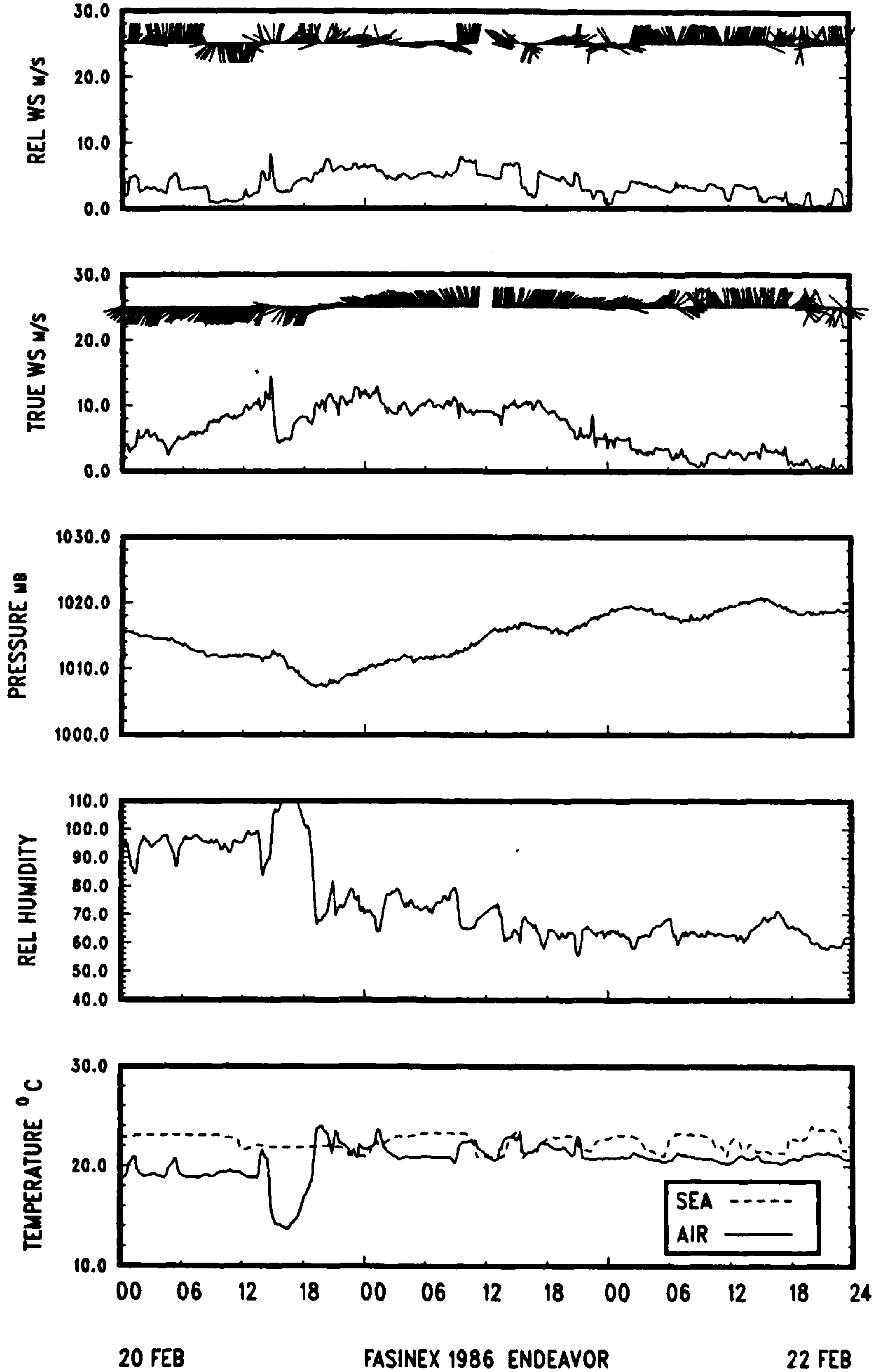
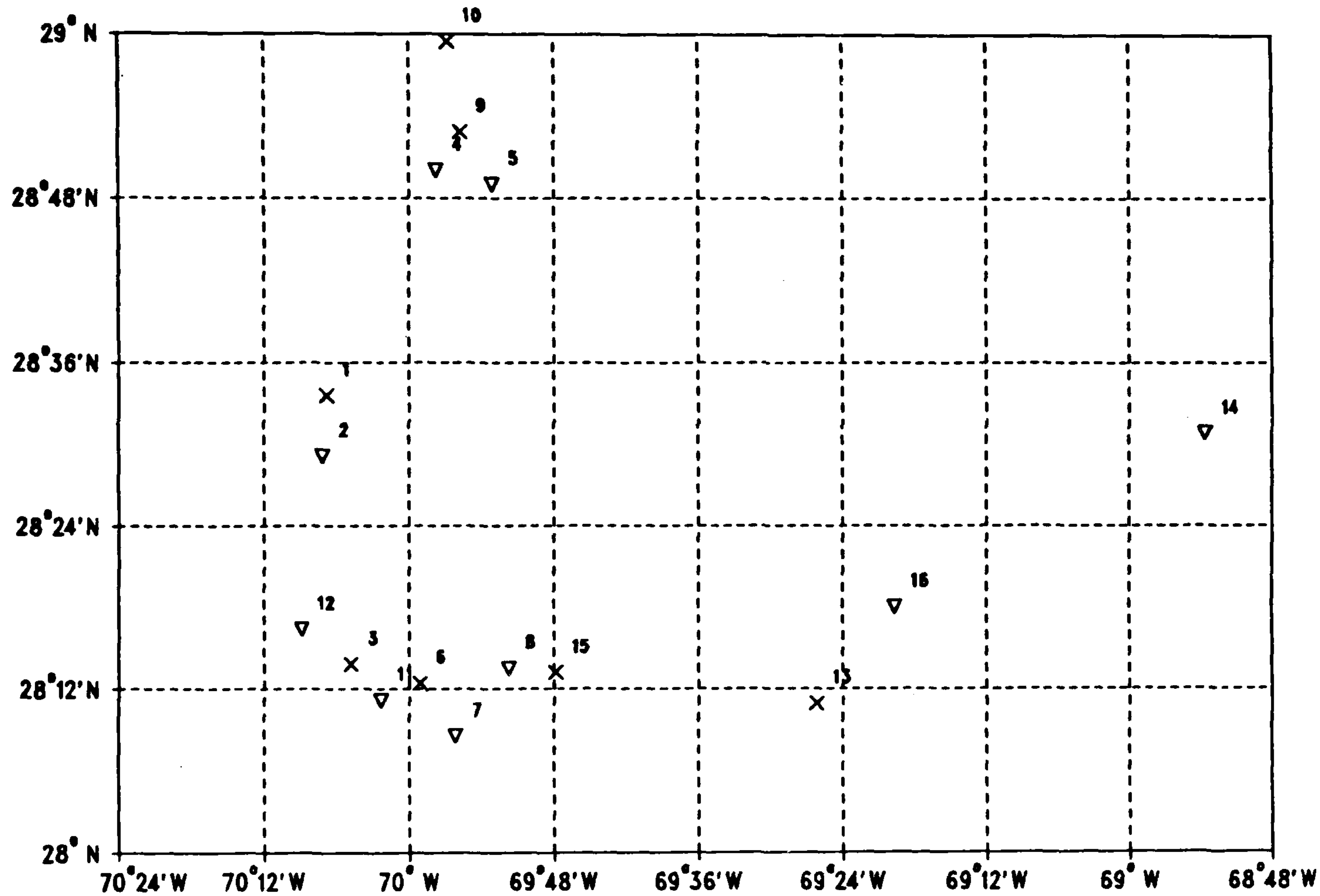

30.0
20.0
10.0
0.0
REL WS m/s
30.0
20.0
10.0
0.0
TRUE WS m/s
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
20 FEB
FASINEX 1986 ENDEAVOR
22 FEB

Fig Vb-1 (Cont)

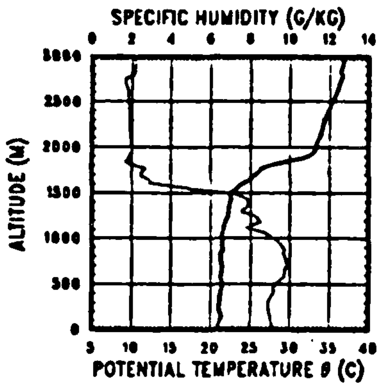
FASINEX RADIOSONDES

20 FEB – 22 FEB

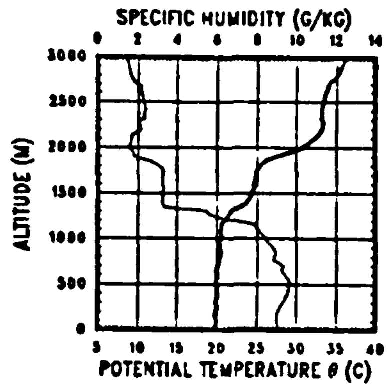


1	20	645	OCE
2	20	1211	END
3	20	1441	OCE
4	20	1507	END
5	20	1854	END
6	20	2023	OCE
7	21	52	END
8	21	1210	END
9	21	1515	OCE
10	21	1915	OCE
11	21	1952	END
12	22	0	END
13	22	612	OCE
14	22	1201	END
15	22	1825	OCE
16	22	1919	END

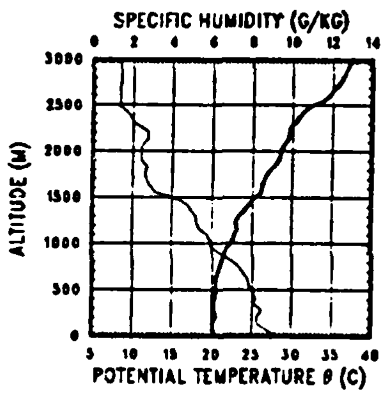
Fig Vb-1 (Cont)



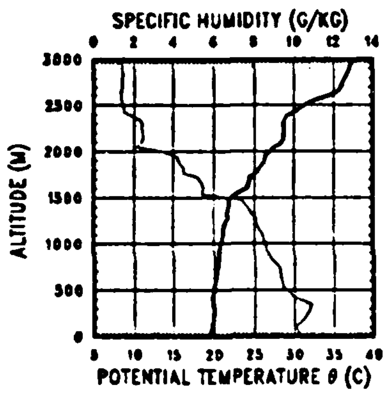
FL43 22 FEB 612Z OCEANUS
LAT 28.11 LONG 69.26



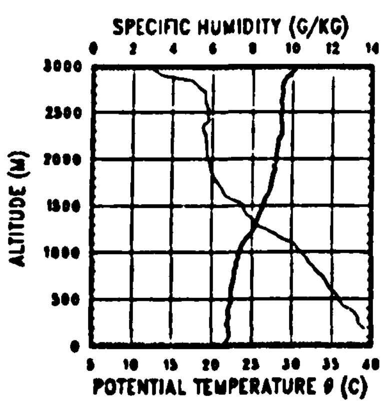
FL30 22 FEB 1201Z ENDEAVOR
LAT 28.32 LONG 68.54



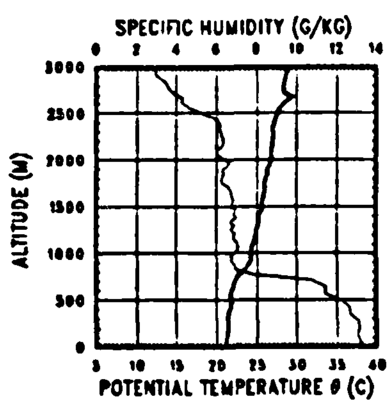
FL41 21 FEB 1515Z OCEANUS
LAT 28.53 LONG 69.55



FL27 21 FEB 1210Z ENDEAVOR
LAT 28.15 LONG 69.53



FL32 20 FEB 645Z OCEANUS
LAT 28.33 LONG 70.06



FL23 20 FEB 1211Z ENDEAVOR
LAT 28.30 LONG 70.08

Fig Vb-1 (Cont)

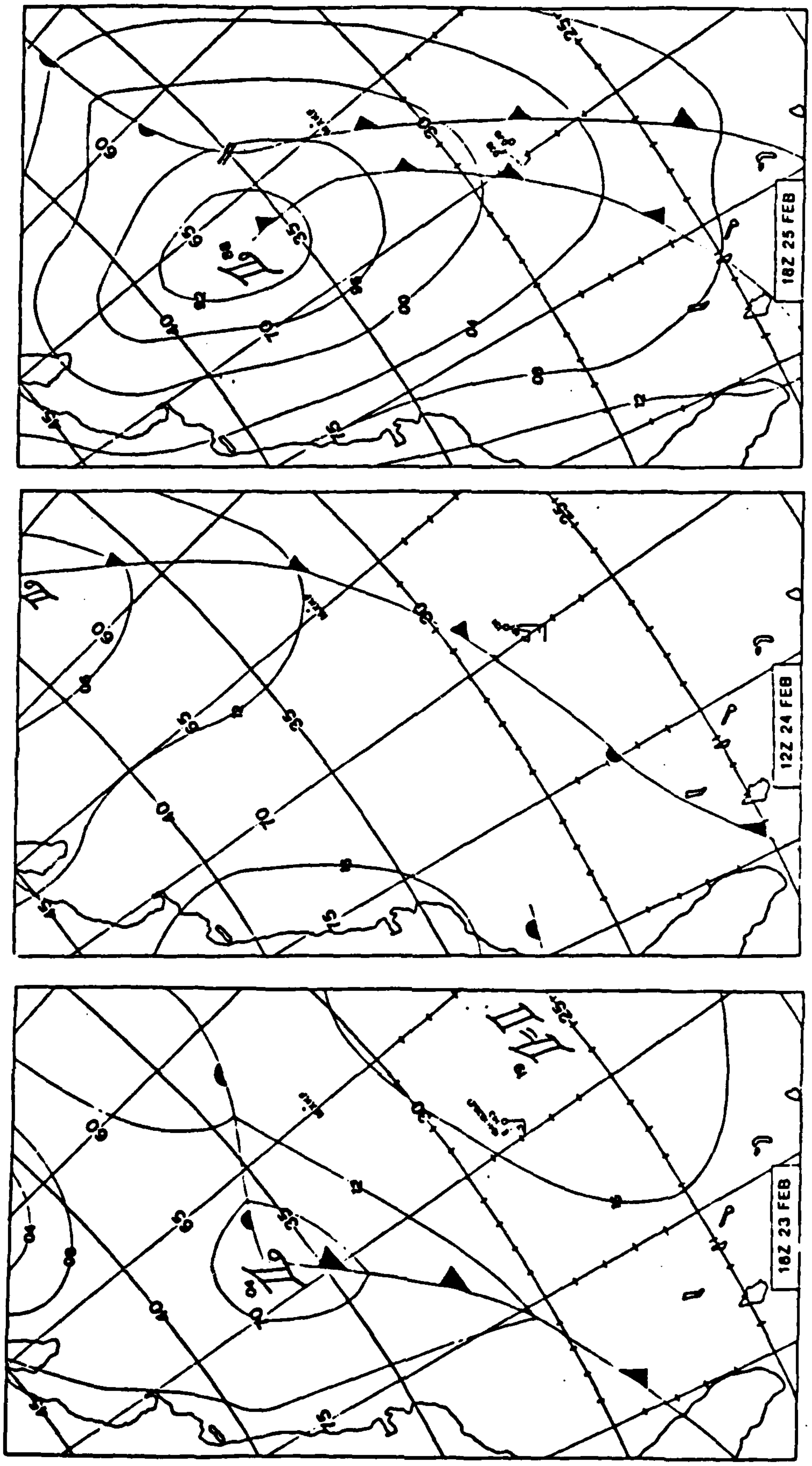
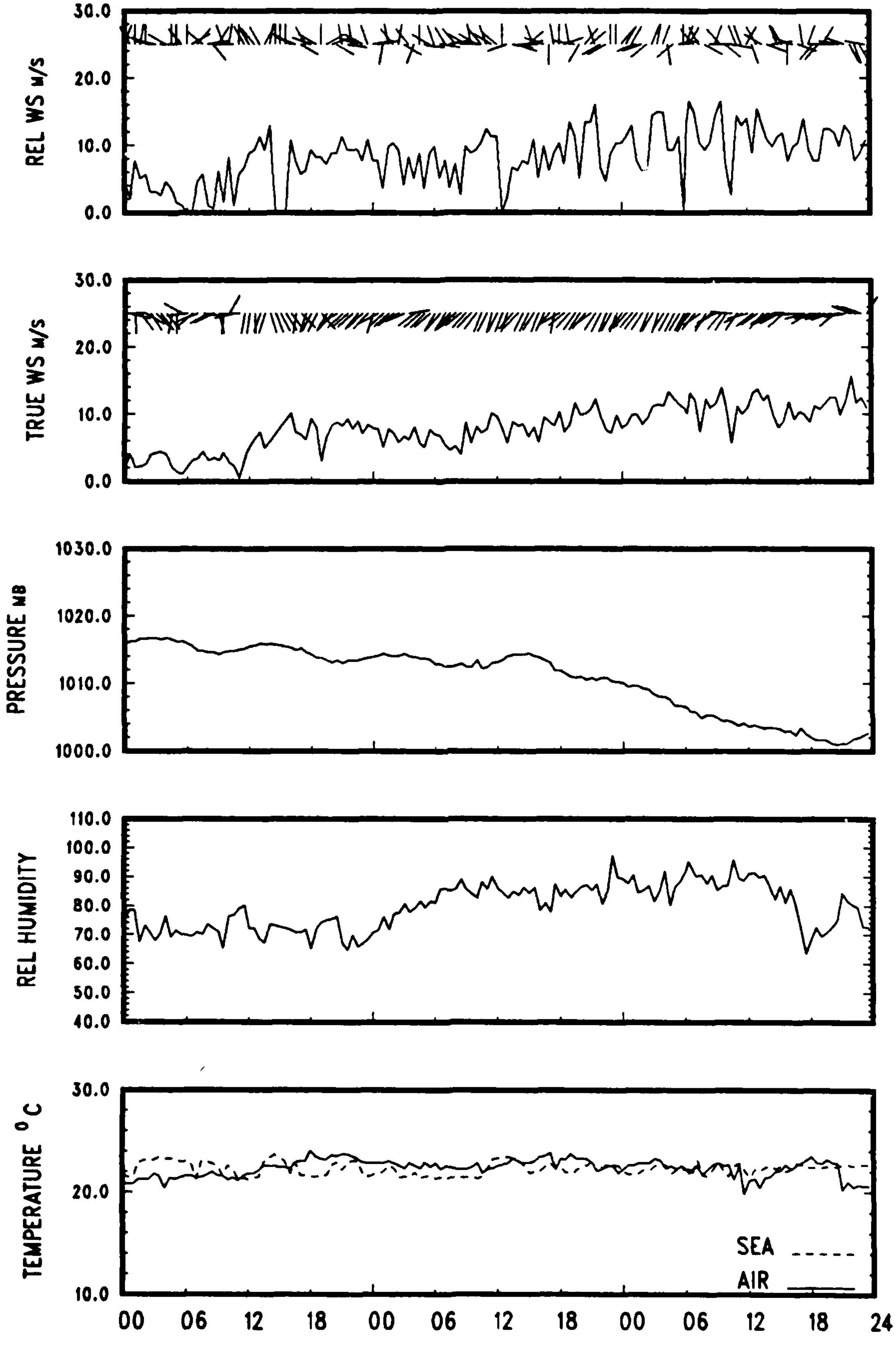
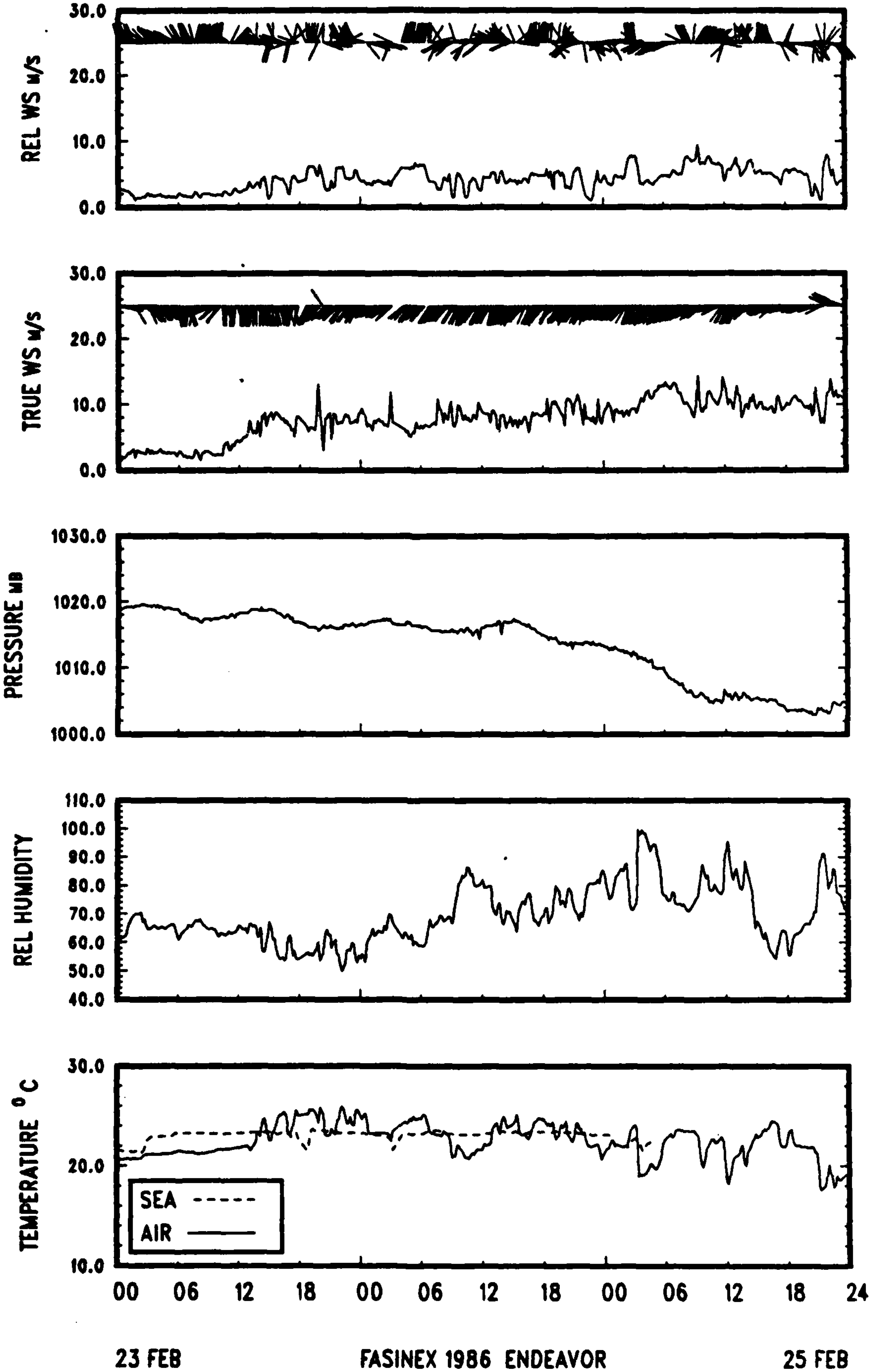


Fig Vb-1 (Cont)



FASINEX 1986 OCEANUS

Fig Vb-1 (Cont)

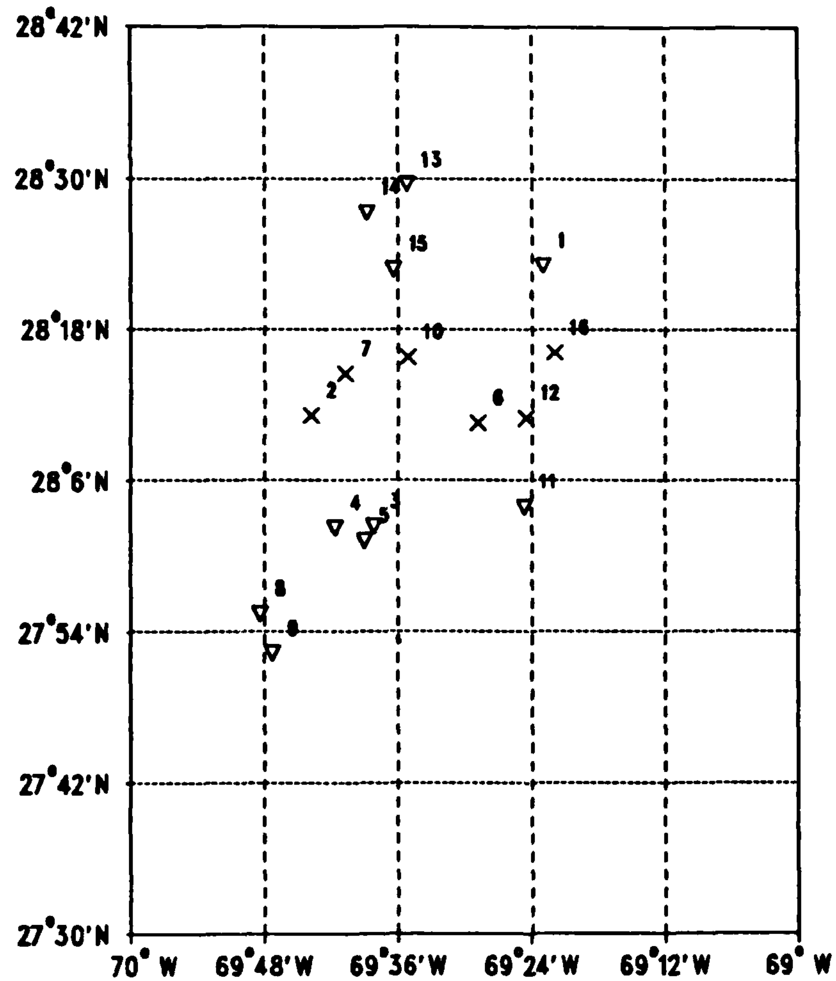


REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
30.0
20.0
10.0
0.0
PRESSURE MB
1030.0
1020.0
1010.0
1000.0
REL HUMIDITY
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
TEMPERATURE °C
30.0
20.0
10.0
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
23 FEB
FASINEX 1986 ENDEAVOR
25 FEB

Fig Vb-1 (Cont)

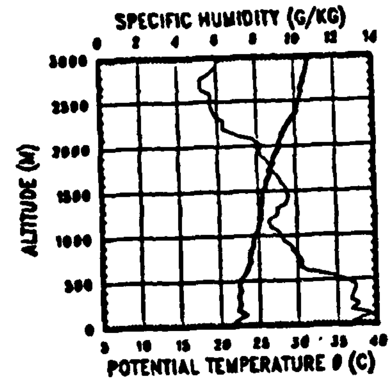
FASINEX RADIOSONDES

23 FEB – 25 FEB

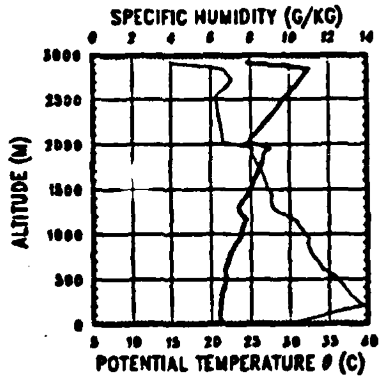


1	23	0	END
2	23	608	OCE
3	23	1209	END
4	23	2027	END
5	24	1	END
6	24	545	OCE
7	24	1358	OCE
8	24	1413	END
9	24	1832	END
10	24	2020	OCE
11	24	2356	END
12	25	601	OCE
13	25	1230	END
14	25	1343	END
15	25	1759	END
16	25	2233	OCE

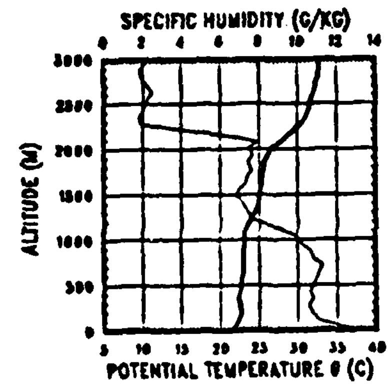
Fig Vb-1 (Cont)



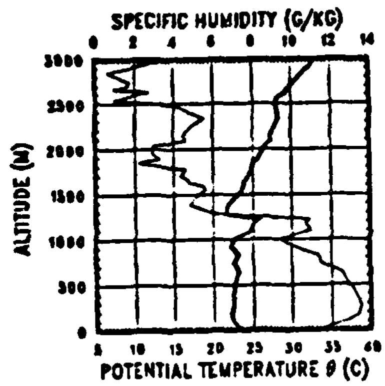
FL51 25 FEB 601Z OCEANUS
LAT 28.11 LONG 69.24



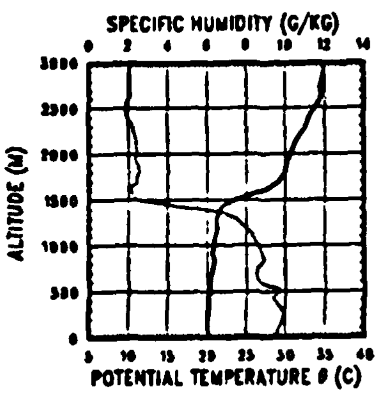
FL40 25 FEB 1343Z ENDEAVOR
LAT 28.28 LONG 69.39



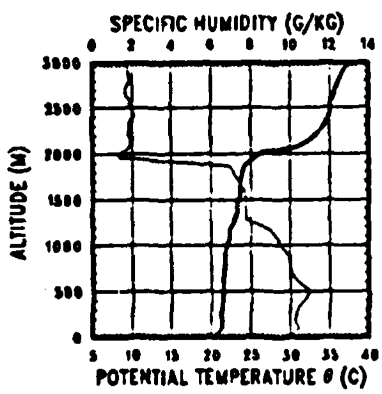
FL48 24 FEB 545Z OCEANUS
LAT 28.10 LONG 69.29



FL36 24 FEB 1413Z ENDEAVOR
LAT 27.56 LONG 69.49



FL47 23 FEB 608Z OCEANUS
LAT 28.11 LONG 69.44



FL33 23 FEB 1209Z ENDEAVOR
LAT 28.03 LONG 69.38

Fig Vb-1 (Cont)

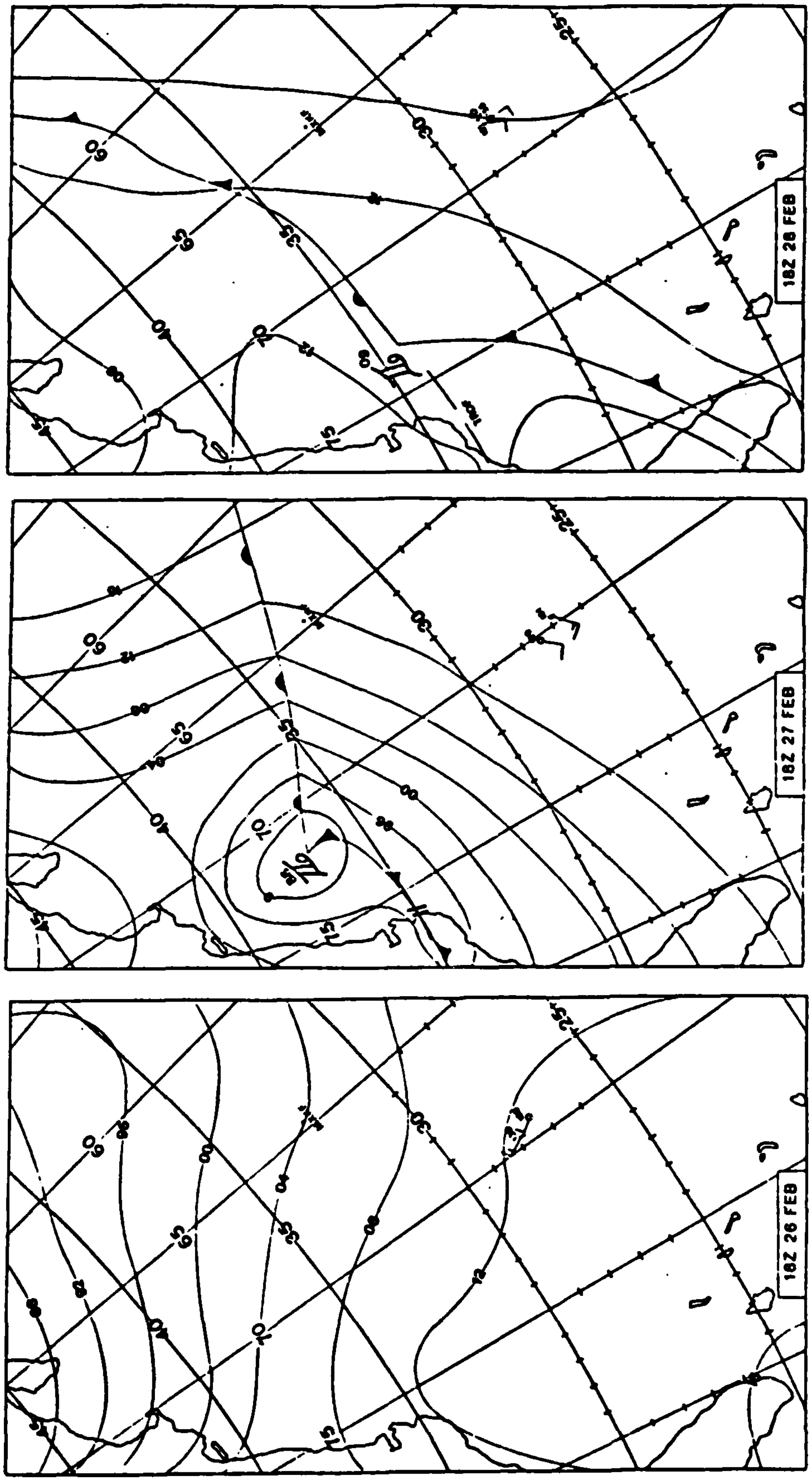


Fig Vb-1 (Cont)

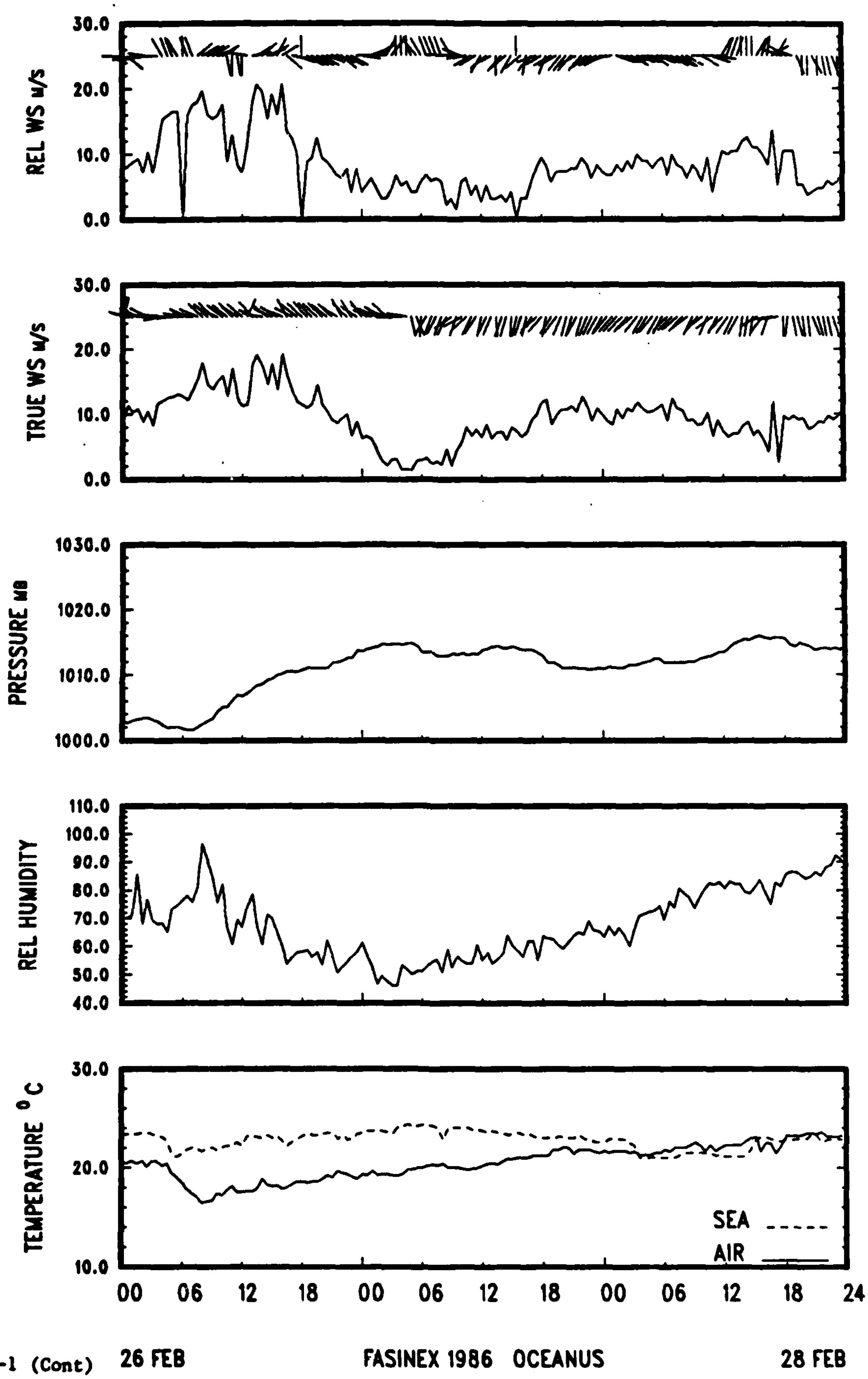

30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
26 FEB
FASINEX 1986 OCEANUS
28 FEB

Fig Vb-1 (Cont)

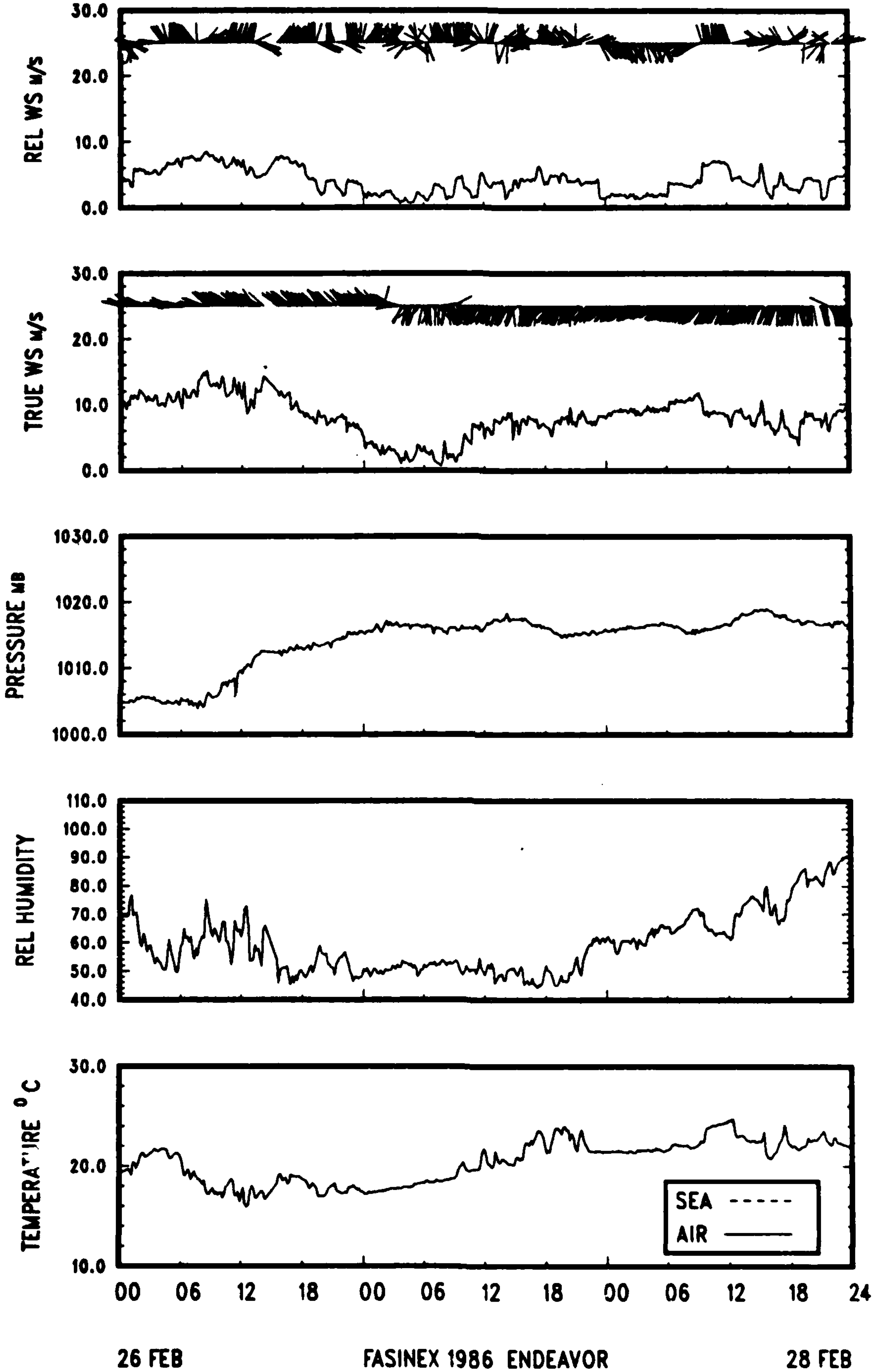
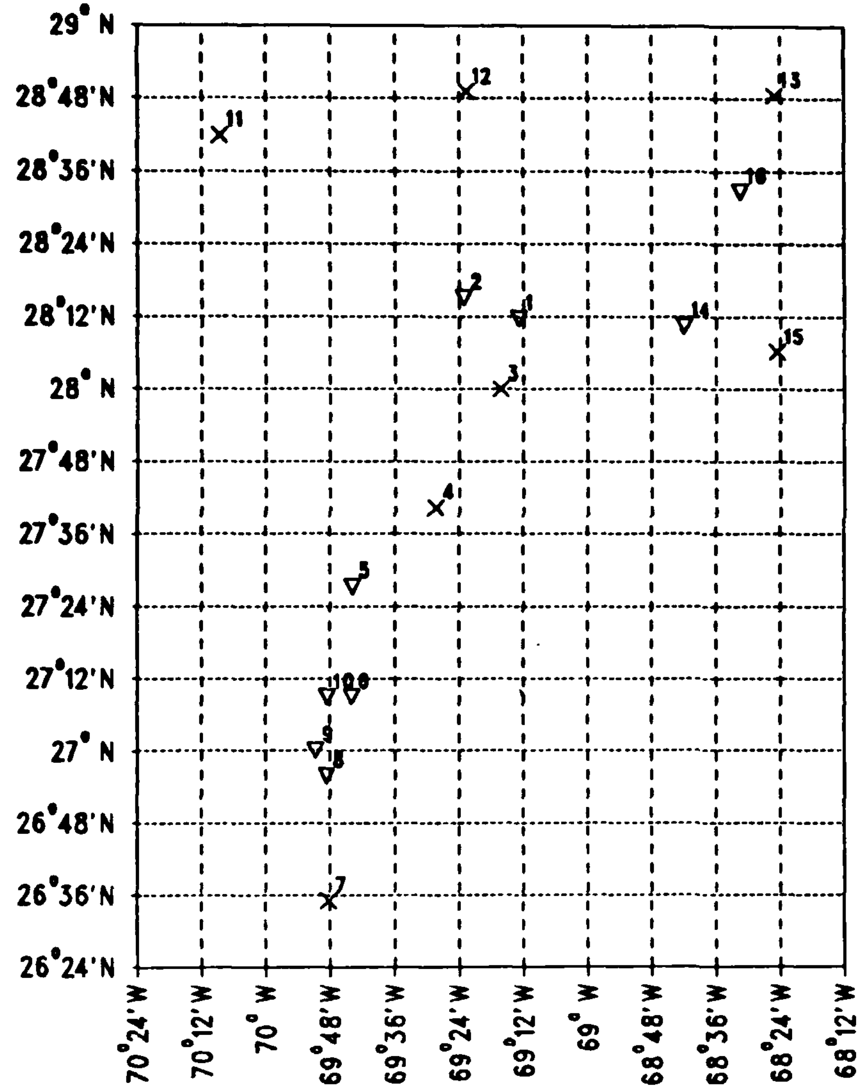

30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
26 FEB
FASINEX 1986 ENDEAVOR
28 FEB

Fig Vb-1 (Cont)

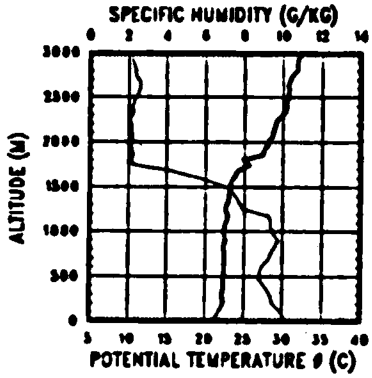
FASINEX RADIOSONDES

26 FEB – 28 FEB

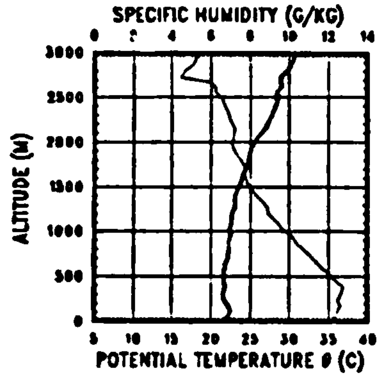


1	26	8	END
2	26	1159	END
3	26	1402	OCE
4	26	1825	OCE
5	26	2306	END
6	27	315	END
7	27	557	OCE
8	27	1213	END
9	27	1926	END
10	27	2357	END
11	28	16	OCE
12	28	549	OCE
13	28	1156	OCE
14	28	1400	END
15	28	1748	OCE
16	28	2351	END

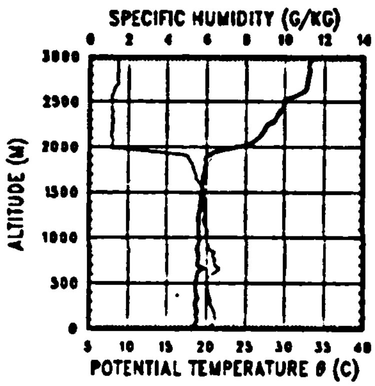
Fig Vb-1 (Cont)



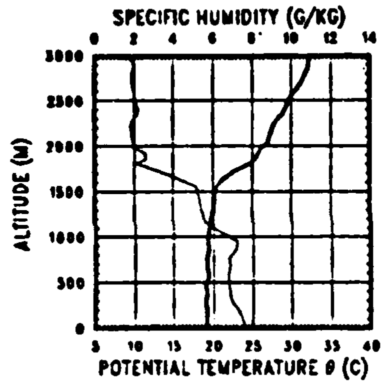
FL60 28 FEB 549Z OCEANUS
LAT 28.49 LONG 69.22



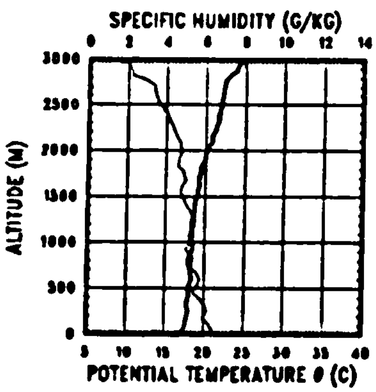
FL49 28 FEB 1400Z ENDEAVOR
LAT 28.10 LONG 68.42



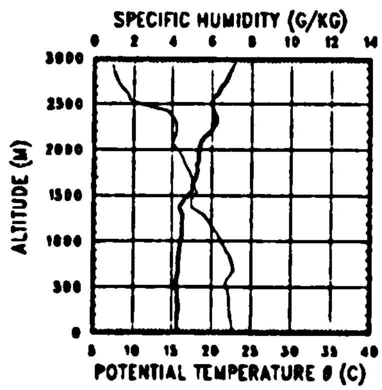
FL57 27 FEB 557Z OCEANUS
LAT 26.35 LONG 69.48



FL46 27 FEB 1213Z ENDEAVOR
LAT 26.57 LONG 69.49



FL55 26 FEB 1402Z OCEANUS
LAT 27.60 LONG 69.16



FL43 26 FEB 1159Z ENDEAVOR
LAT 28.16 LONG 69.23

Fig Vb-1 (Cont)

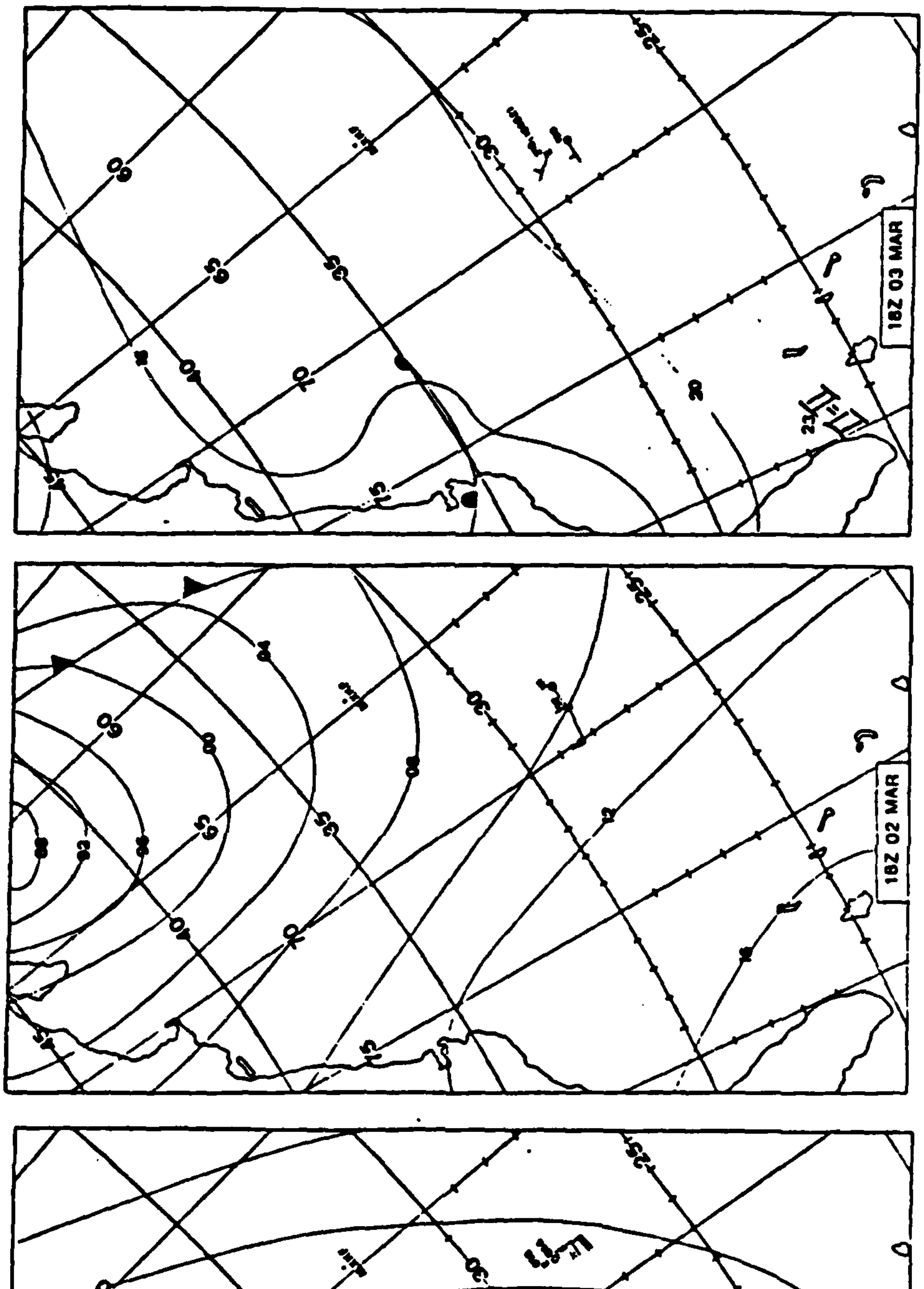
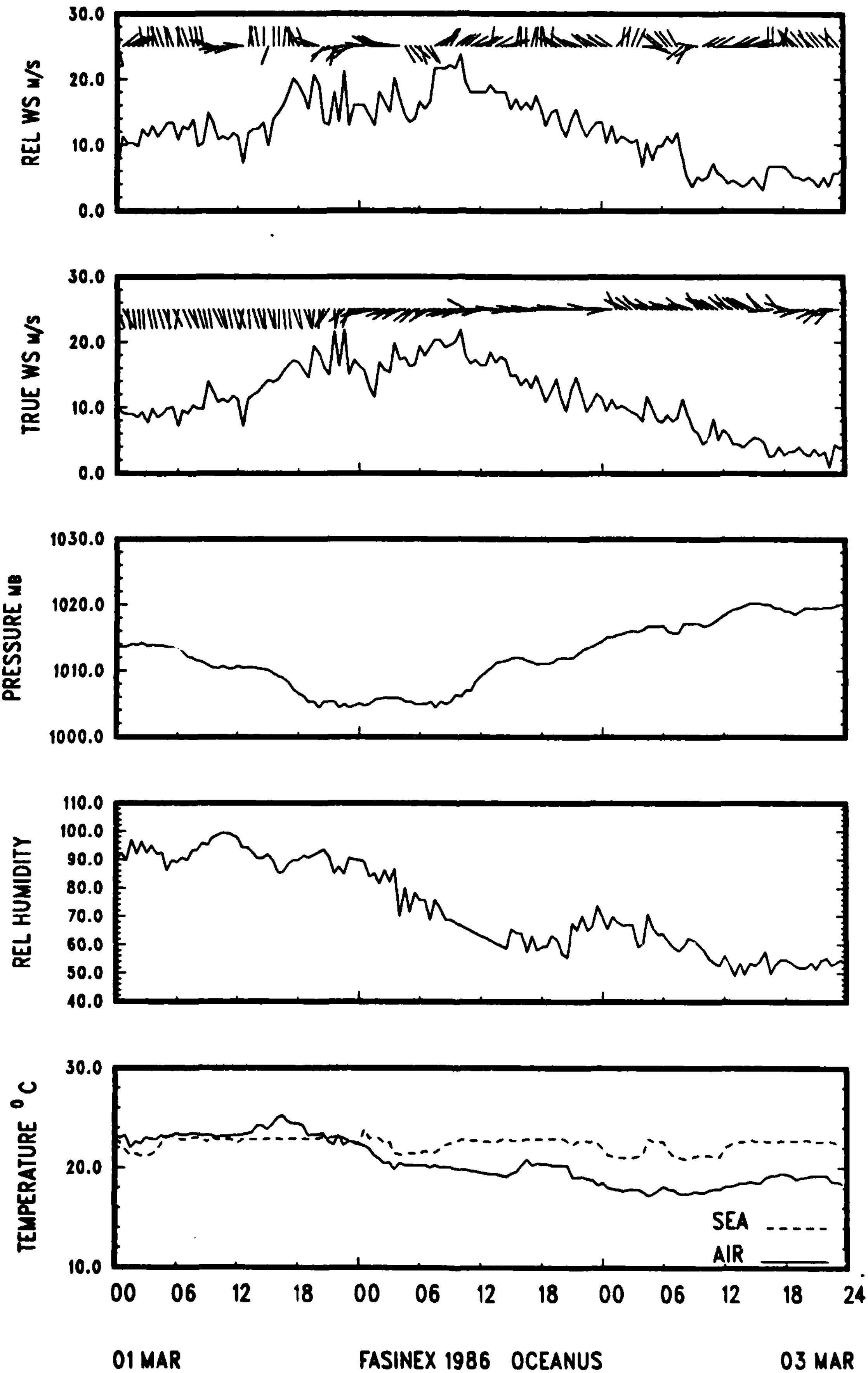


Fig Vb-1 (Cont)



30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
01 MAR
FASINEX 1986 OCEANUS
03 MAR

Fig Vb-1 (Cont)

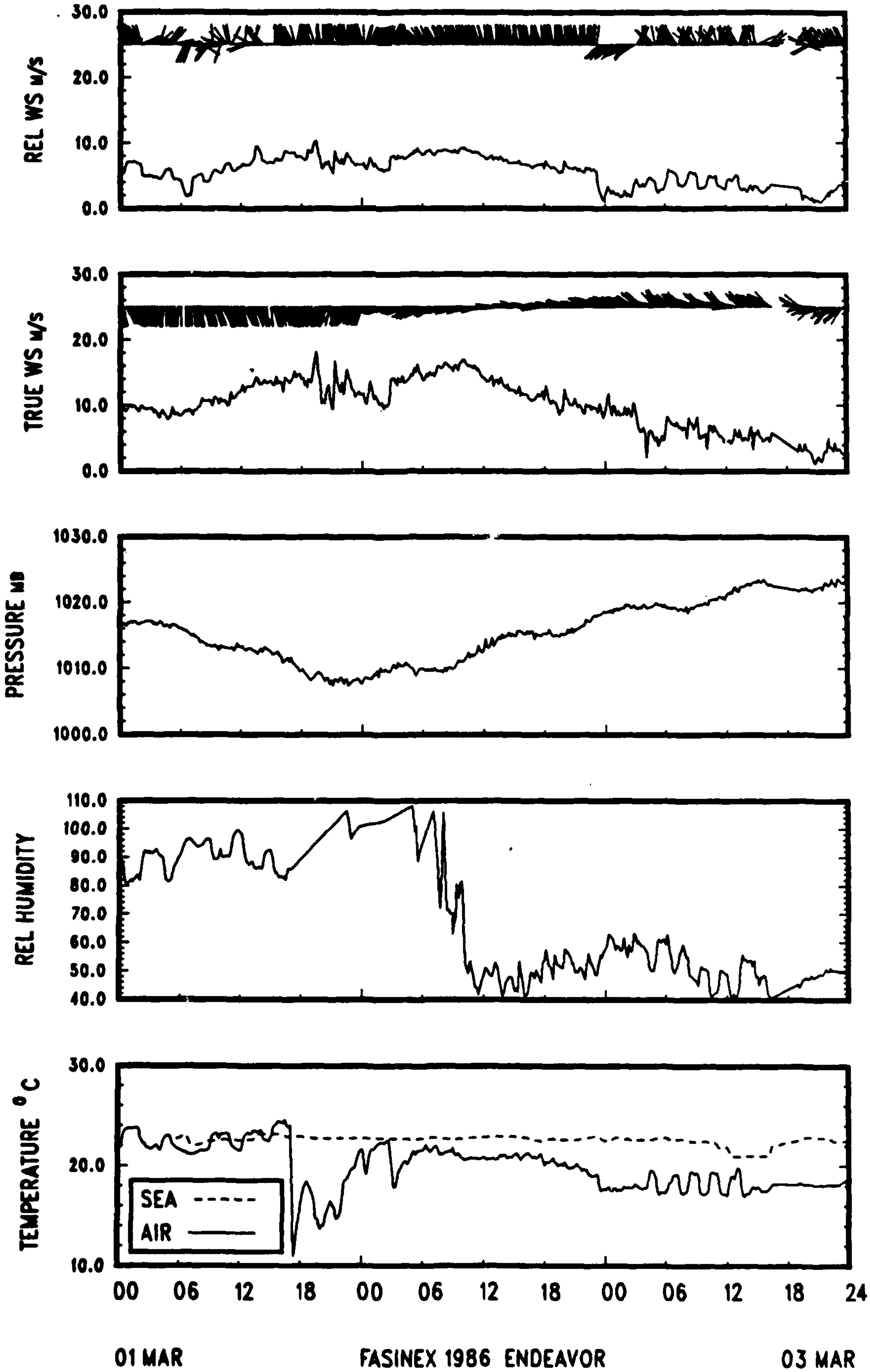
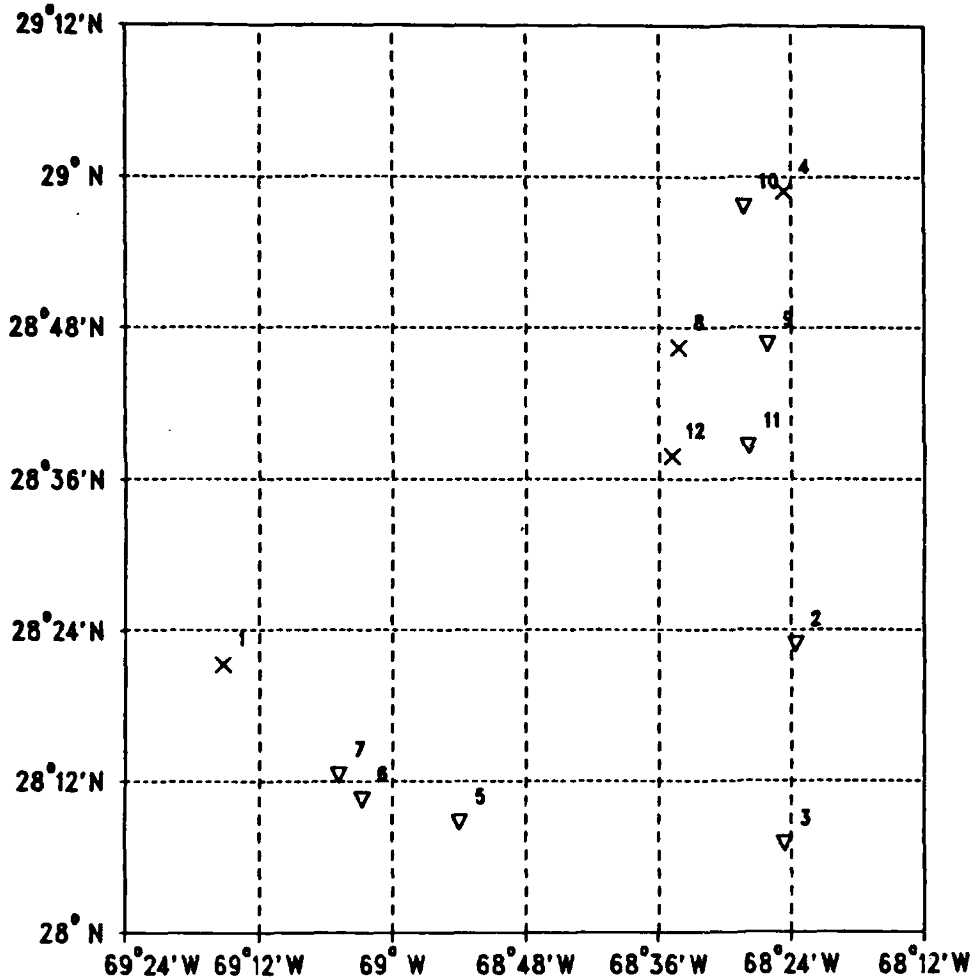

30.0
20.0
10.0
0.0
REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
01 MAR
FASINEX 1986 ENDEAVOR
03 MAR

Fig Vb-1 (Cont)

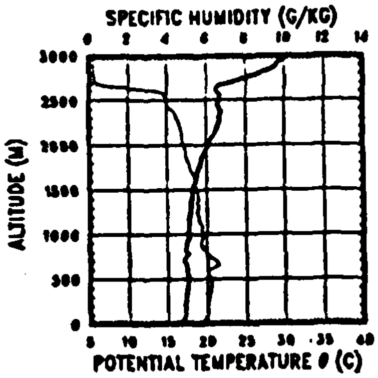
FASINEX RADIOSONDES

01 MAR – 03 MAR



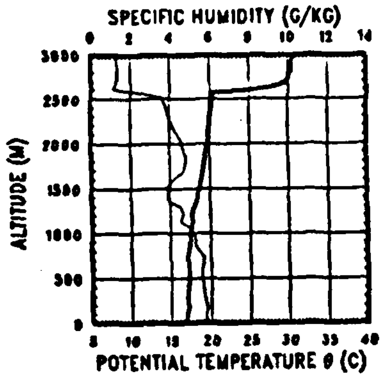
1	1	554	OCE
2	1	1414	END
3	2	8	END
4	2	554	OCE
5	2	1449	END
6	2	1806	END
7	3	10	END
8	3	558	OCE
9	3	1157	END
10	3	1500	END
11	3	2054	END
12	3	2210	OCE

Fig Vb-1 (Cont)



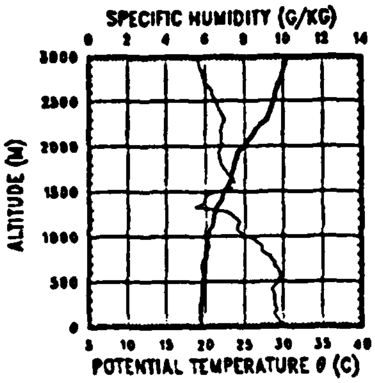
FL67 3 MAR 558Z OCEANUS

LAT 28.46 LONG 68.34



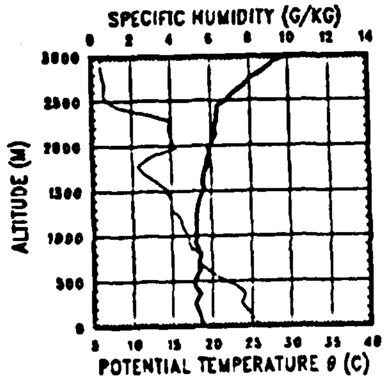
FL56 3 MAR 1157Z ENDEAVOR

LAT 28.47 LONG 68.26



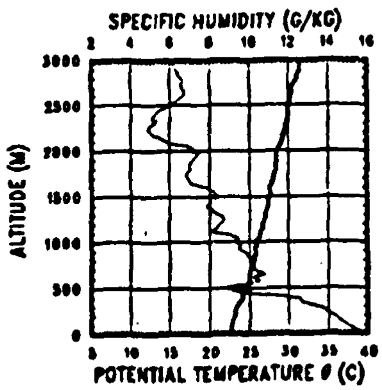
FL65 2 MAR 554Z OCEANUS

LAT 28.56 LONG 68.24



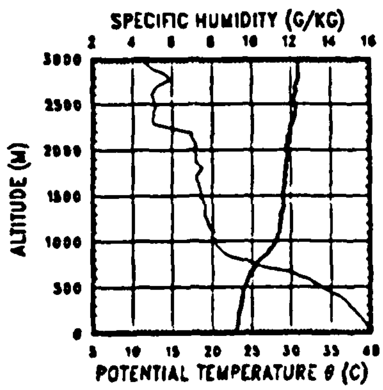
FL54 2 MAR 1806Z ENDEAVOR

LAT 28.11 LONG 69.03



FL63 1 MAR 554Z OCEANUS

LAT 28.21 LONG 69.15



FL51 1 MAR 1414Z ENDEAVOR

LAT 28.24 LONG 68.24

Fig Vb-1 (Cont)

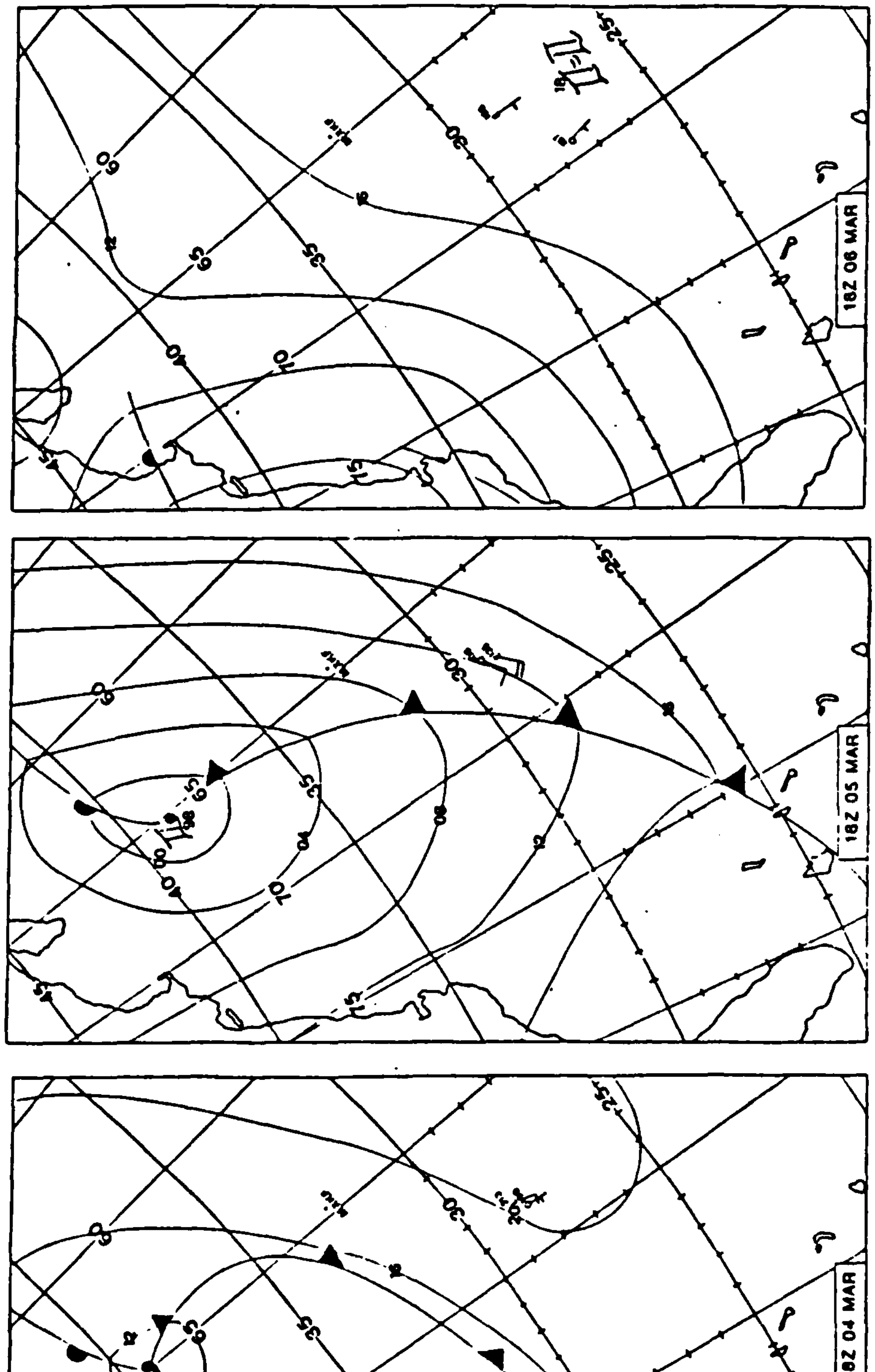


Fig Vb-1 (Cont)

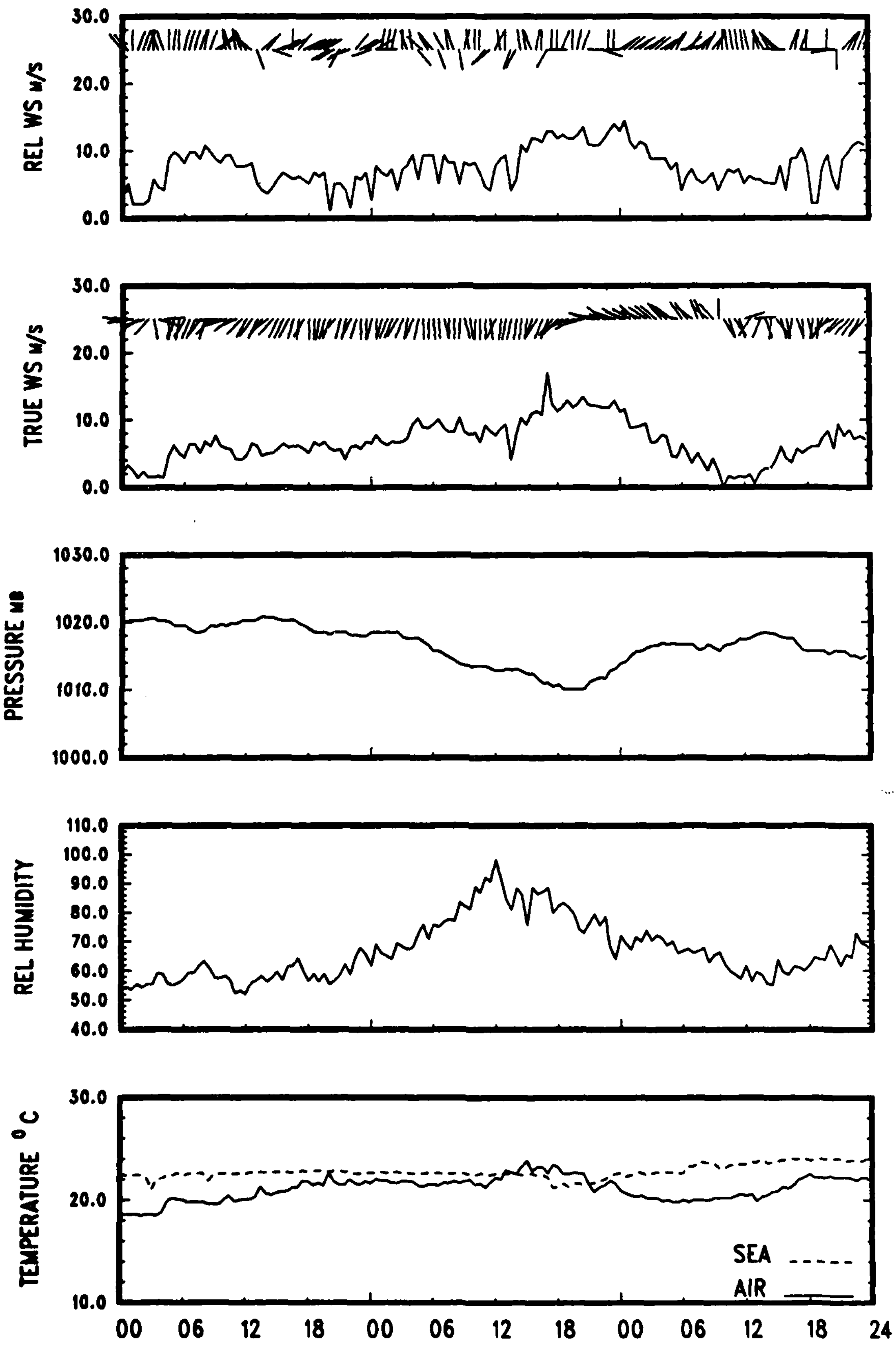


Fig Vb-1 (Cont) 04 MAR FASINEX 1986 OCEANUS 06 MAR

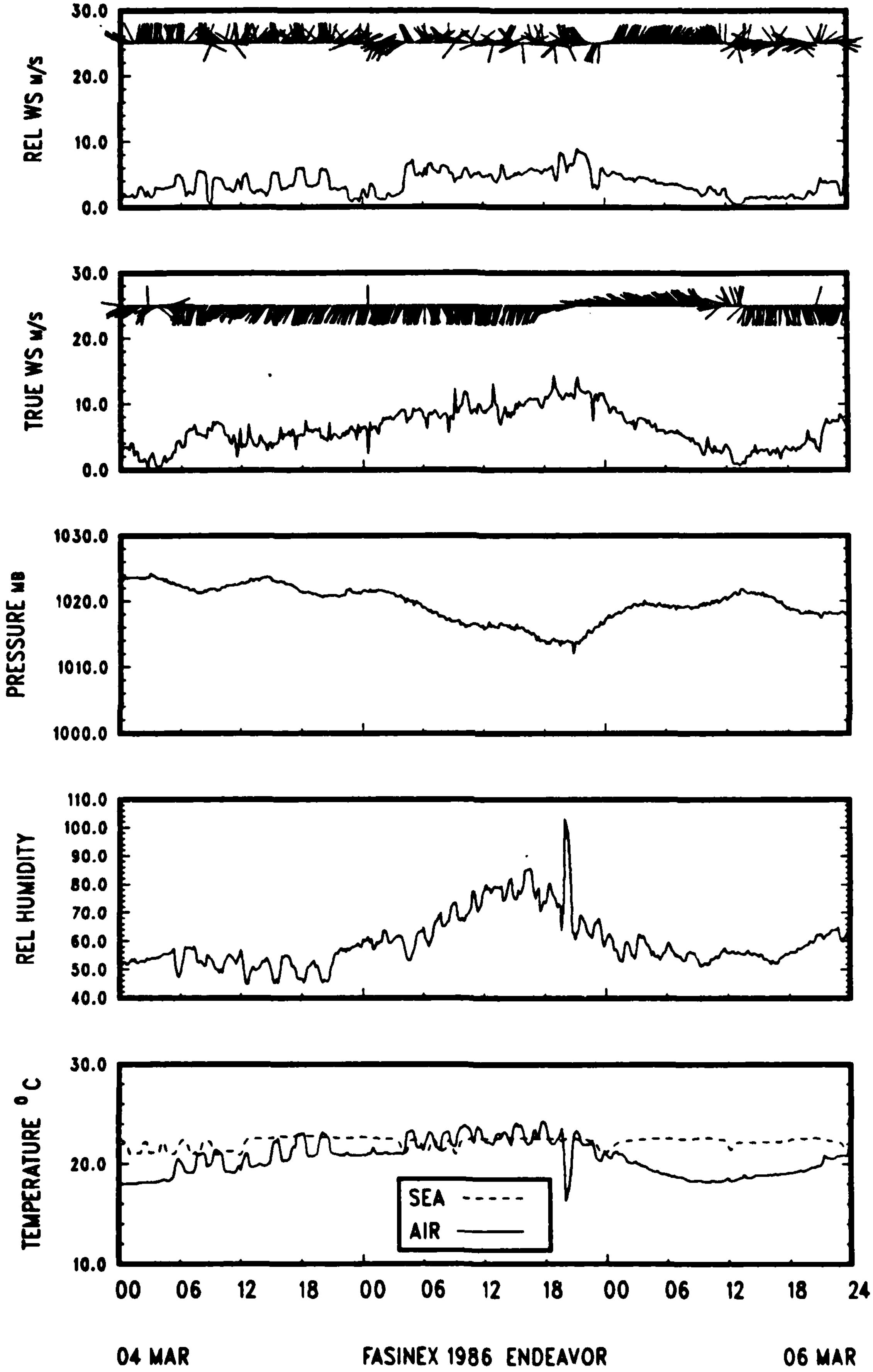
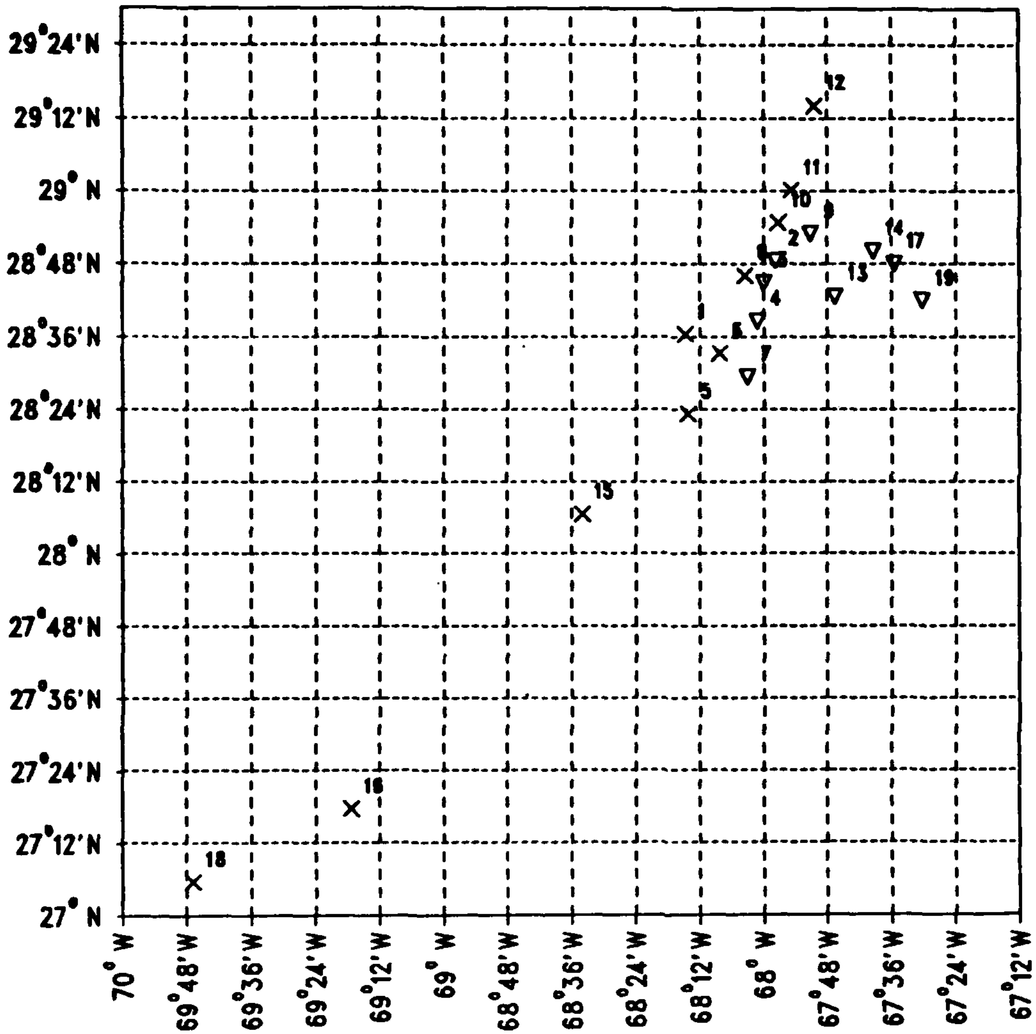

30.0
20.0
10.0
0.0
REL WS m/s
30.0
20.0
10.0
0.0
TRUE WS m/s
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
30.0
20.0
10.0
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
04 MAR
FASINEX 1986 ENDEAVOR
06 MAR

Fig Vb-1 (Cont)

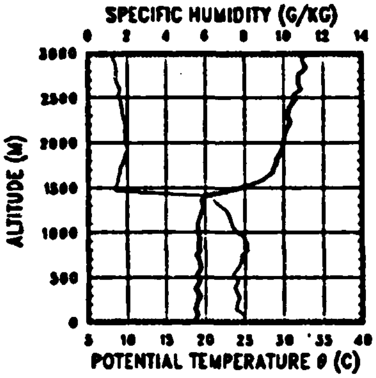
FASINEX RADIOSONDES

04 MAR – 06 MAR



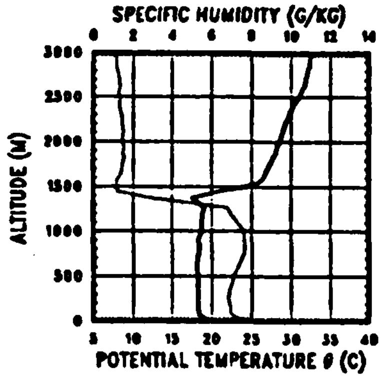
1	4	557	OCE
2	4	1114	END
3	4	1156	END
4	4	1310	END
5	4	1926	OCE
6	4	2348	OCE
7	5	14	END
8	5	542	OCE
9	5	616	END
10	5	952	OCE
11	5	1331	OCE
12	5	1952	OCE
13	5	2054	END
14	6	5	END
15	6	602	OCE
16	6	1151	OCE
17	6	1226	END
18	6	1757	OCE
19	6	2001	END

Fig Vb-1 (Cont)



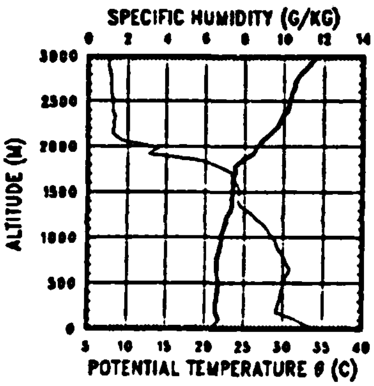
FL76 6 MAR 602Z OCEANUS

LAT 28.06 LONG 68.34



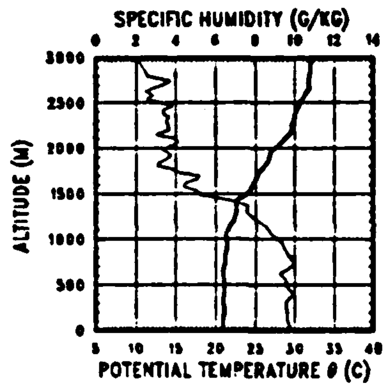
FL67 6 MAR 1226Z ENDEAVOR

LAT 28.50 LONG 67.36



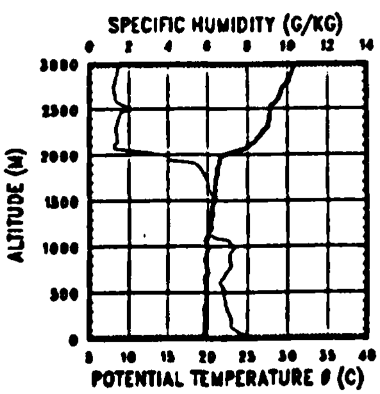
FL72 5 MAR 542Z OCEANUS

LAT 28.46 LONG 68.03



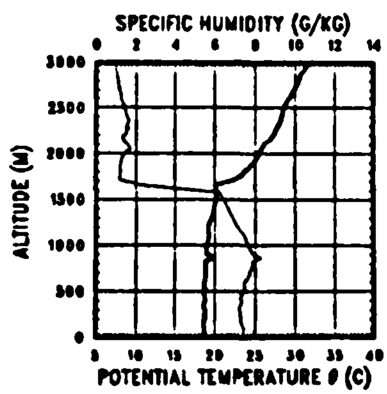
FL65 5 MAR 2054Z ENDEAVOR

LAT 28.45 LONG 67.47



FL59 4 MAR 557Z OCEANUS

LAT 28.36 LONG 68.14



FL61 4 MAR 1156Z ENDEAVOR

LAT 28.46 LONG 68.00

Fig Vb-1 (Cont)

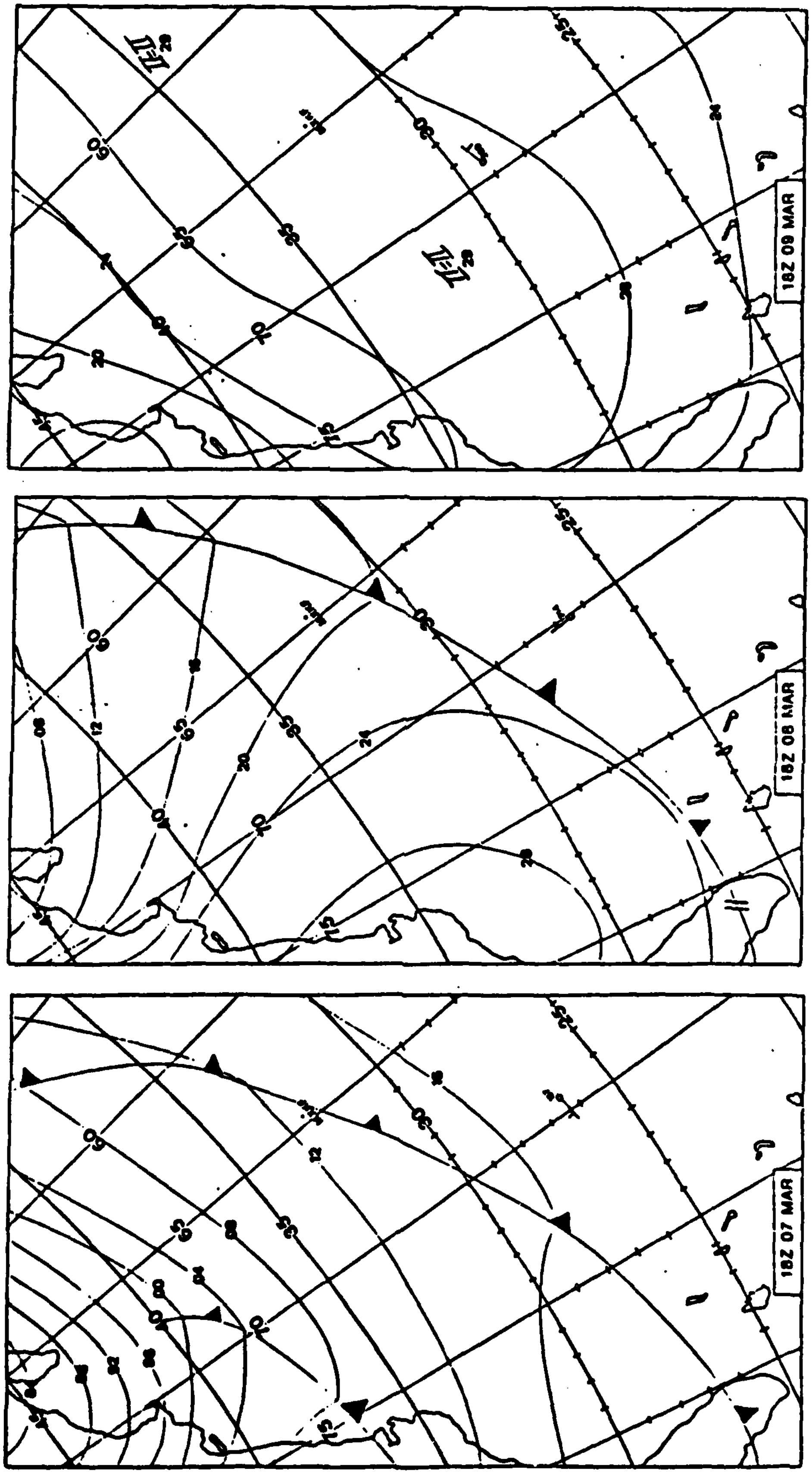
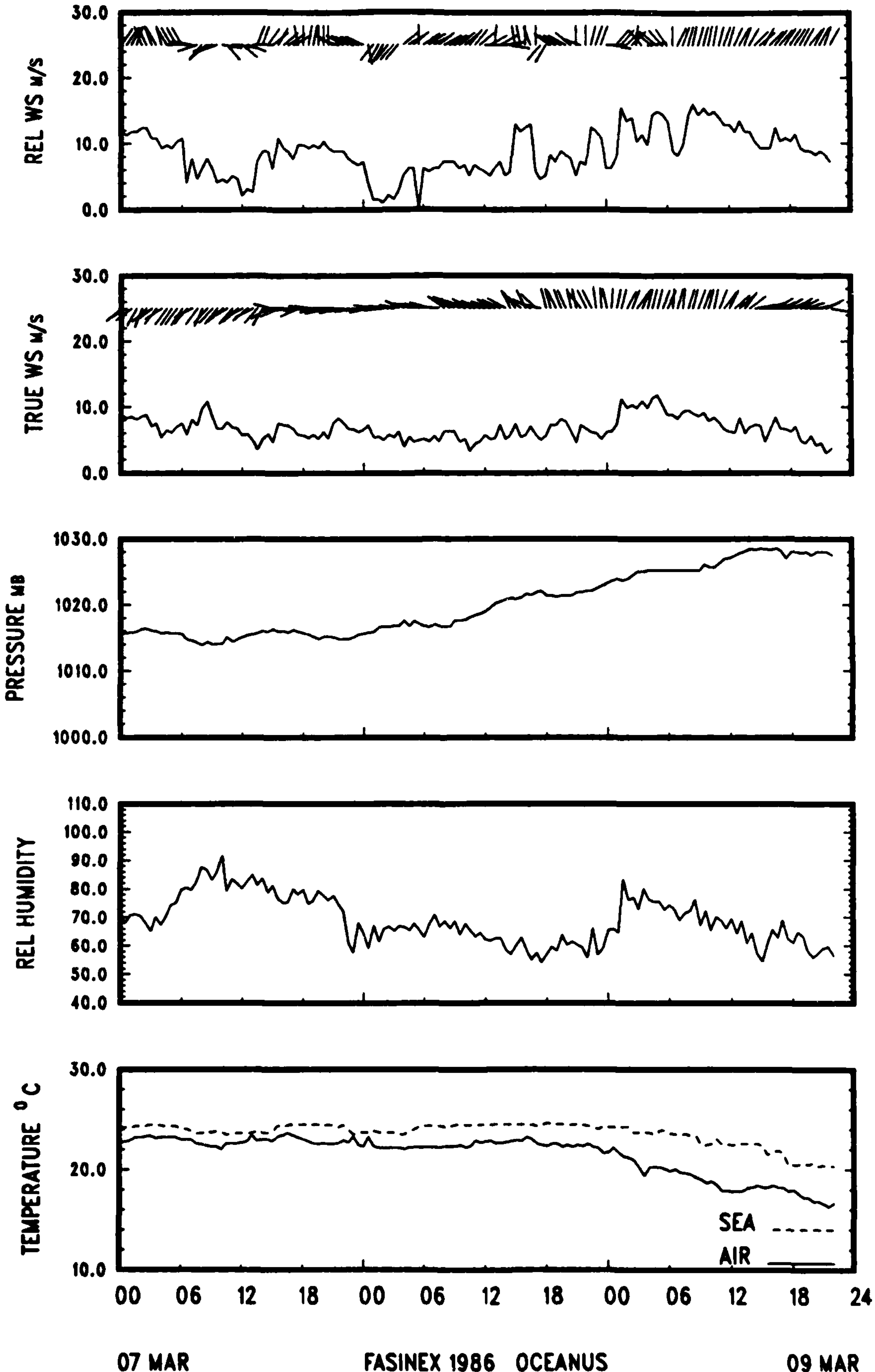
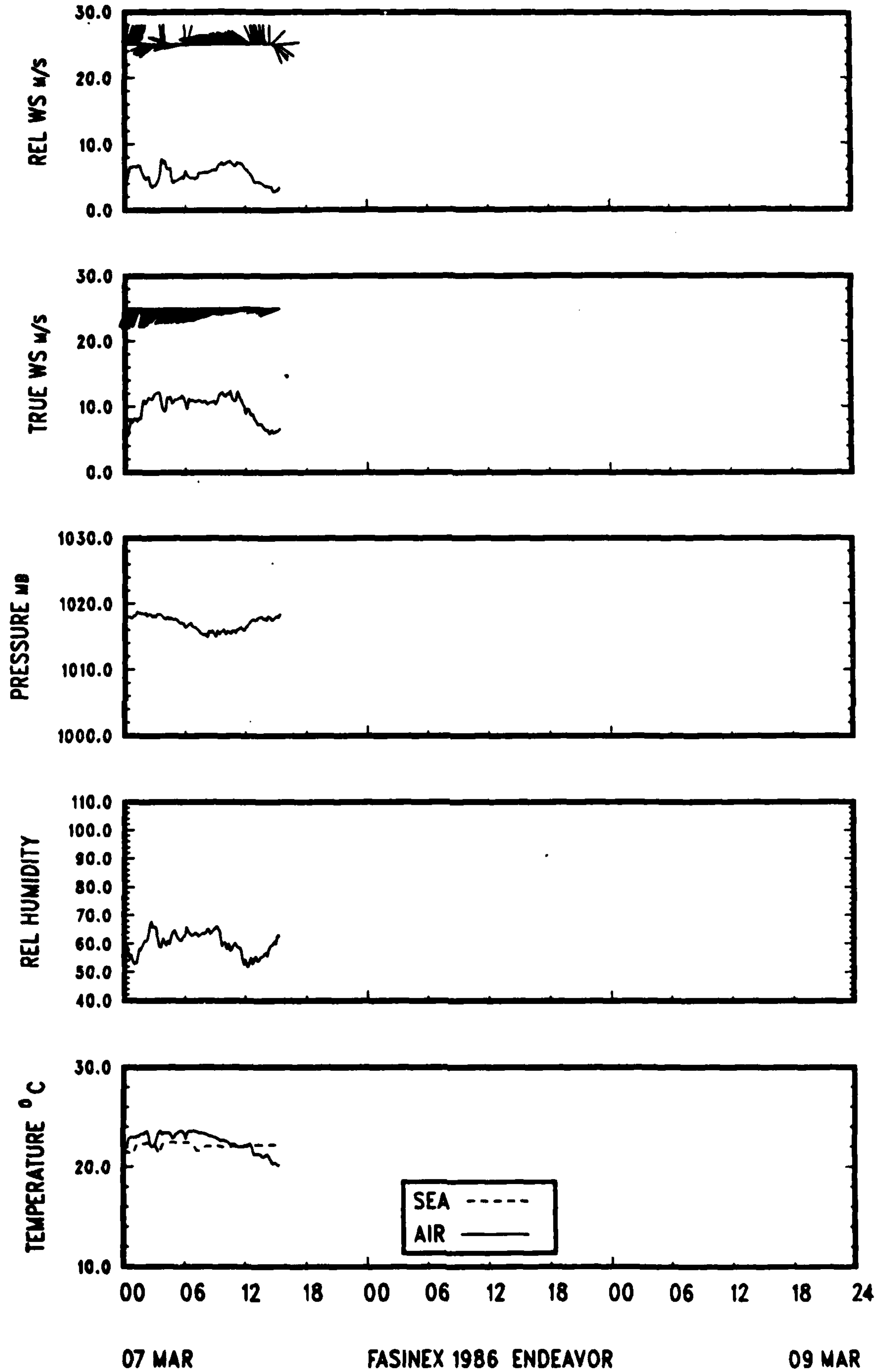


Fig Vb-1 (Cont)



30.0
20.0
10.0
0.0
REL WS M/S
TRUE WS M/S
1030.0
1020.0
1010.0
1000.0
PRESSURE MB
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
REL HUMIDITY
TEMPERATURE °C
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
07 MAR
FASINEX 1986 OCEANUS
09 MAR

Fig Vb-1 (Cont)

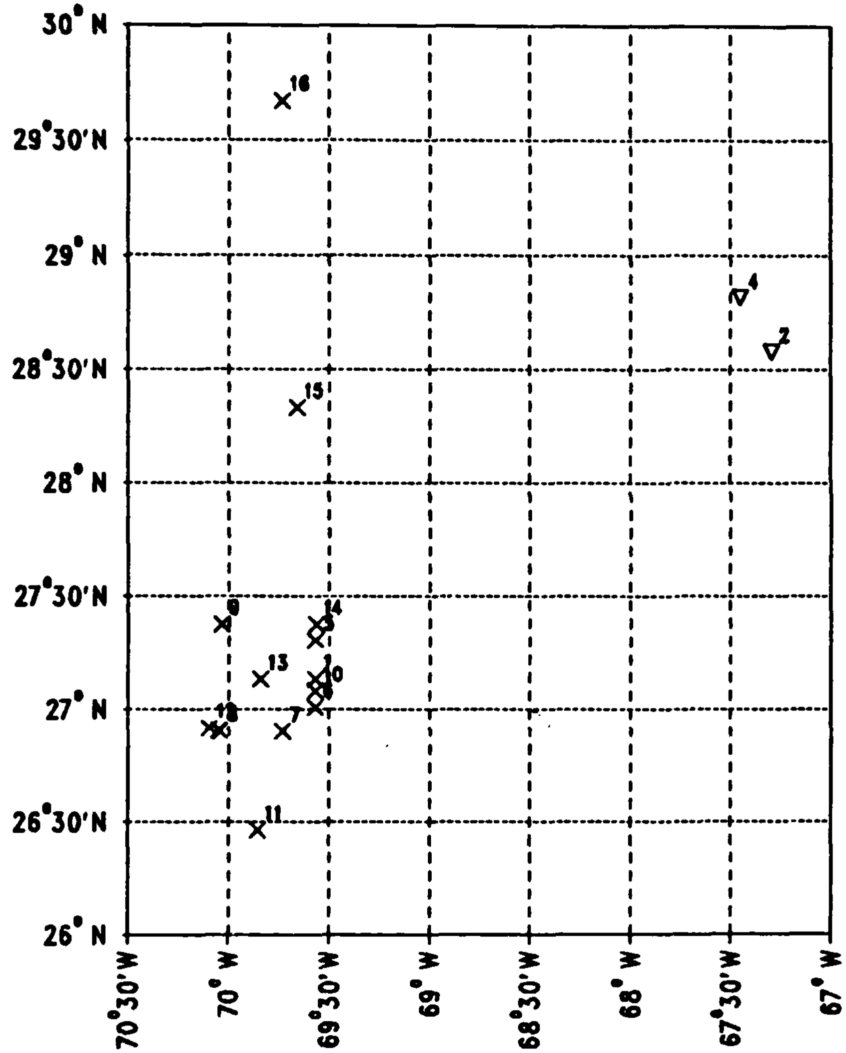


REL WS M/S
30.0
20.0
10.0
0.0
TRUE WS M/S
30.0
20.0
10.0
0.0
PRESSURE MB
1030.0
1020.0
1010.0
1000.0
REL HUMIDITY
110.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
TEMPERATURE °C
30.0
20.0
10.0
SEA
AIR
00 06 12 18 00 06 12 18 00 06 12 18 24
07 MAR
FASINEX 1986 ENDEAVOR
09 MAR

Fig Vb-1 (Cont)

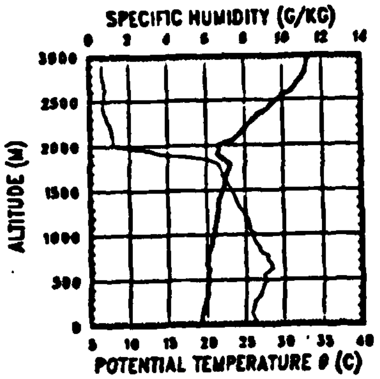
FASINEX RADIOSONDES

07 MAR – 09 MAR



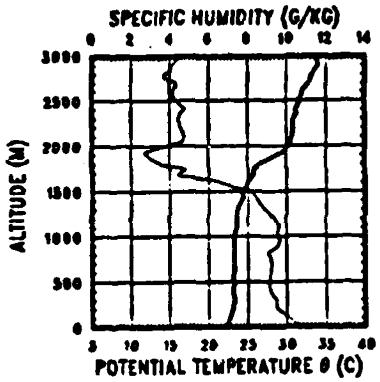
1	7	11	OCE
2	7	14	END
3	7	551	OCE
4	7	606	END
5	7	1346	OCE
6	7	1609	OCE
7	7	1807	OCE
8	7	2026	OCE
9	8	25	OCE
10	8	611	OCE
11	8	1216	OCE
12	8	1756	OCE
13	8	2358	OCE
14	9	637	OCE
15	9	1223	OCE
16	9	1849	OCE

Fig Vb-1 (Cont)



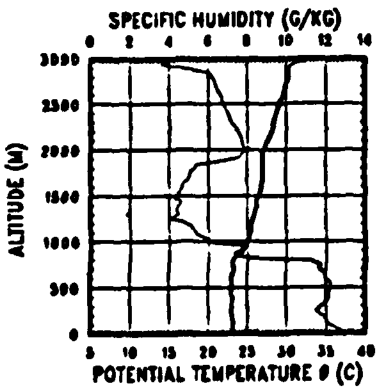
FL90 9 MAR 637Z OCEANUS

LAT 27.22 LONG 69.33



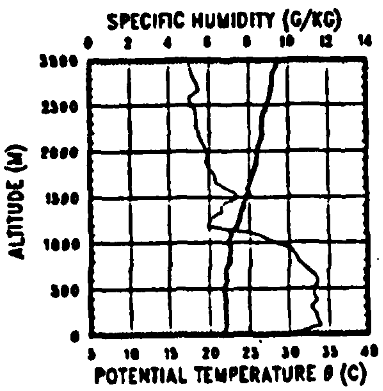
FL87 8 MAR 1216Z OCEANUS

LAT 26.28 LONG 69.51



FL80 7 MAR 551Z OCEANUS

LAT 26.54 LONG 70.02



FL70 7 MAR 606Z ENDEAVOR

LAT 28.50 LONG 67.28

Fig Vb-1 (Cont)

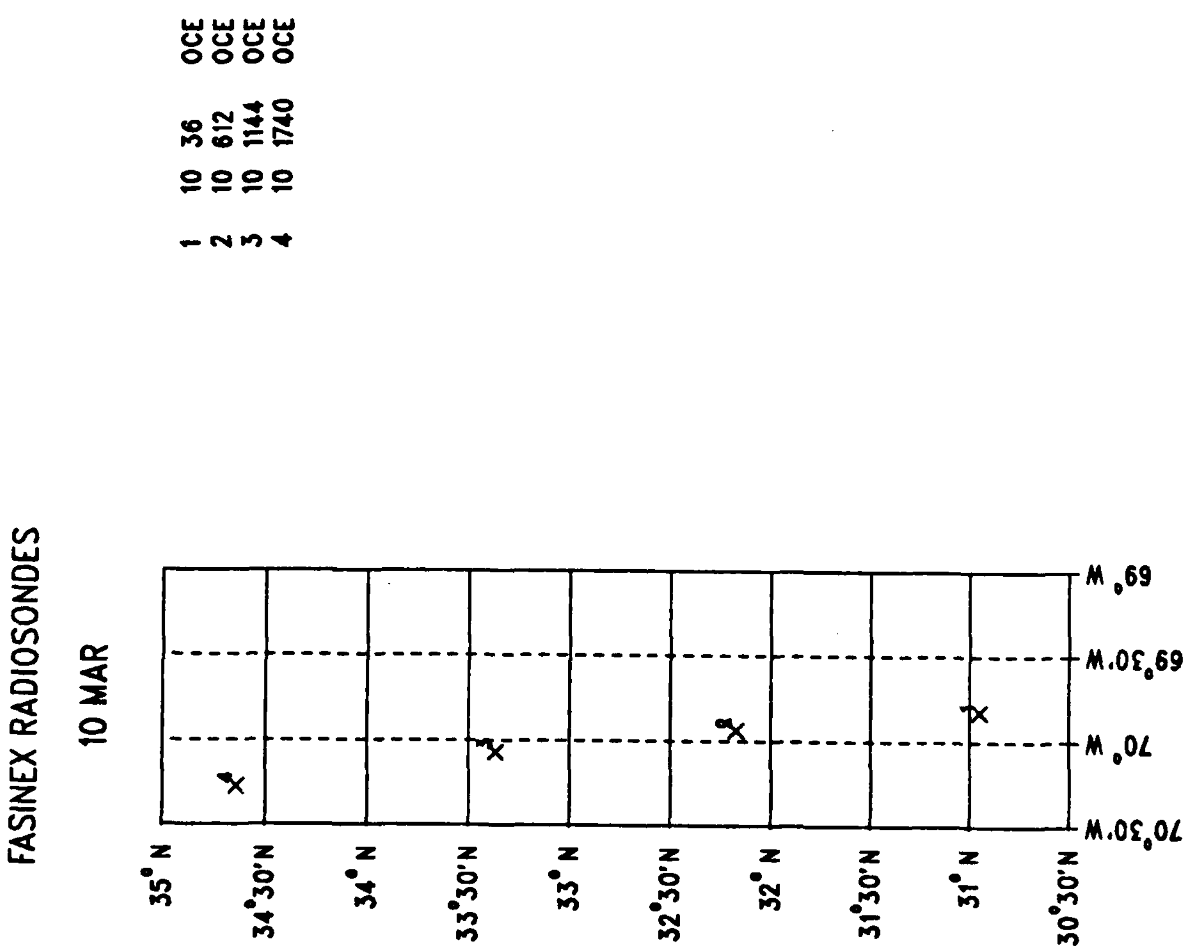

FASINEX RADIOSONDES
10 MAR
1 10 36 OCE
2 10 612 OCE
3 10 1144 OCE
4 10 1740 OCE
35° N
34°30'N
34° N
33°30'N
33° N
32°30'N
32° N
31°30'N
31° N
30°30'N
69° W
69°30'W
70° W
70°30'W
1
2
3
4

Fig Vb-1 (Cont)

TABLE Vb-1

Naval Postgraduate School and University of Washington
Shipboard Meteorological Measurements

Measurements on Endeavor only except those indicated by *.
*Indicates measurements on both Endeavor and Oceanus.

Measurements	Sensor/System	Endeavor and Oceanus Frequency
Radiation (down)	Long/short wave radiometers (U of Washington)	Continuous
Sea Surface Temperature	Floating thermister	Continuous
Mean Surface layer: *Wind (speed, direction)	Cup anemometer, bivane	Continuous
Temperature	Resistance thermometer	Continuous
Humidity	Cool mirror	Continuous
Aerosols	Optical counters (.3 to 300 μm)	Continuous
*Turbulent Kinetic Energy Dissipation Rate	Hot film and miniature cups	Continuous
Humidity Variance Dissipation Rate	Lyman-α	Continuous
*Inversion Height	SODAR	Continuous
*Temperature, Humidity, and Wind Profiles	Radiosonde (LORAN-C Omega)	2 to 6/day

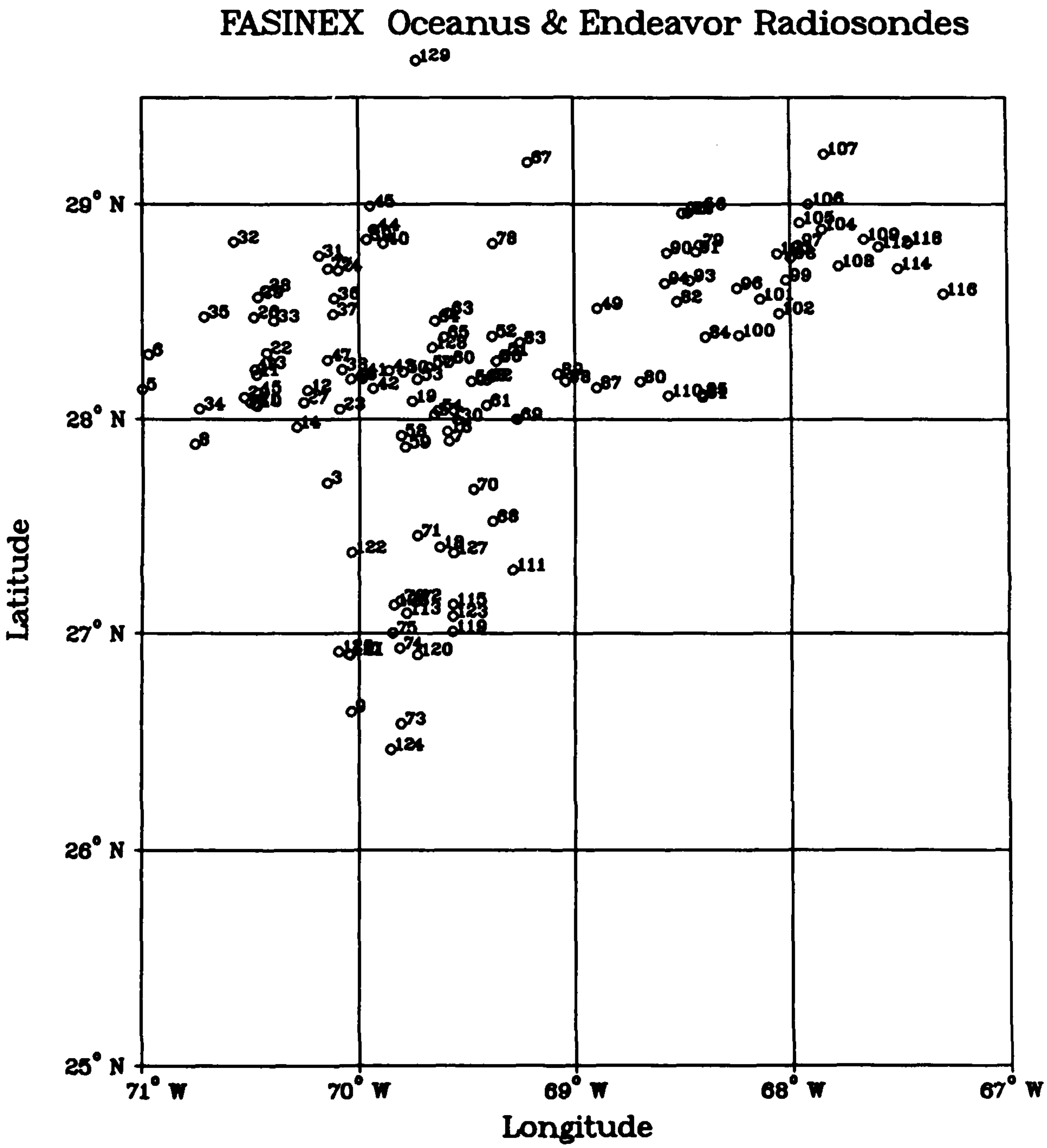


Figure Vb-2: Radiosonde Station Positions.

SAS

DATE	TIME	SHIP	LOC			
860213	1204	ENDEAVOR	69	59.13	28	11.22
	1714	OCEANUS	68	01.47	29	59.32
	1845	ENDEAVOR	70	09.01	27	42.26
860214	0018	ENDEAVOR	70	30.05	28	04.67
	1245	ENDEAVOR	71	00.10	28	08.30
	1510	ENDEAVOR	70	58.32	28	17.96
	1502	OCEANUS	69	35.13	27	53.93
	2345	ENDEAVOR	70	45.57	27	52.99
860215	0545	OCEANUS	70	02.09	26	38.35
	1207	ENDEAVOR	70	28.31	28	03.75
	1800	ENDEAVOR	70	28.51	28	12.38
860216	0043	ENDEAVOR	70	14.29	28	08.03
	0603	ENDEAVOR	70	27.01	28	14.38
	0731	OCEANUS	70	17.39	27	57.80
	1259	ENDEAVOR	70	28.07	28	07.39
	1933	OCEANUS	69	35.54	27	56.54
	2358	ENDEAVOR	70	28.94	28	13.86
	2358	OCEANUS	69	37.66	27	24.04
860217	0607	OCEANUS	69	45.21	28	05.03
	1213	ENDEAVOR	70	31.88	29	06.13
	1804	ENDEAVOR	70	29.00	28	04.26
	2352	ENDEAVOR	70	25.53	28	18.42
860218	0049	OCEANUS	70	05.40	28	02.31
	0548	OCEANUS	70	05.72	28	41.39
	1200	ENDEAVOR	70	27.71	28	22.99
	1459	ENDEAVOR	70	29.03	28	28.41
	1521	OCEANUS	70	15.38	28	04.59
	1826	ENDEAVOR	70	25.38	28	35.92
860219	0030	ENDEAVOR	70	27.97	28	33.97
	0603	OCEANUS	69	32.79	27	59.76
	1200	ENDEAVOR	70	11.01	29	45.57
	1215	OCEANUS	70	34.58	28	49.43
	1757	ENDEAVOR	70	23.53	28	27.37
	2027	OCEANUS	70	44.21	28	02.86
	2334	OCEANUS	70	42.97	29	28.46
860220	0645	OCEANUS	70	06.81	28	33.56
	1211	ENDEAVOR	70	07.10	29	29.11
	1441	OCEANUS	70	04.78	28	13.83
	1507	ENDEAVOR	69	57.75	28	50.05
	1954	ENDEAVOR	69	53.08	28	49.00
	2023	OCEANUS	69	59.12	28	12.43
860221	0052	ENDEAVOR	69	56.15	28	08.54
	1210	ENDEAVOR	69	51.76	28	13.52
	1515	OCEANUS	69	55.77	28	52.97
	1915	OCEANUS	69	56.90	28	59.45
	1952	ENDEAVOR	70	02.33	28	11.17
860222	0000	ENDEAVOR	70	08.97	28	16.42
	0612	OCEANUS	69	26.19	28	10.94
	1201	ENDEAVOR	68	53.62	28	30.80
	1825	OCEANUS	69	47.84	28	13.19
	1919	ENDEAVOR	69	19.65	28	18.03
860223	0000	ENDEAVOR	69	23.01	28	23.11
	0616	OCEANUS	69	43.86	28	11.17
	1200	ENDEAVOR	69	38.11	28	02.33
	2027	ENDEAVOR	69	41.65	28	02.23

Table Vb-2: Radiosonde Launch Times and Locations.

SAS

DATE	TIME	SHIP	LOC			
860224	0001	ENDEAVOR	69	39.06	28	01.19
	0545	OCEANUS	69	28.86	28	10.58
	1359	OCEANUS	69	40.73	28	14.46
	1413	ENDEAVOR	69	48.43	27	55.41
	1932	ENDEAVOR	69	47.29	27	52.28
	2020	OCEANUS	69	35.10	28	15.82
	2356	ENDEAVOR	69	24.61	28	03.90
860225	0601	OCEANUS	69	24.55	28	10.97
	1230	ENDEAVOR	69	35.23	28	29.52
	1343	ENDEAVOR	69	38.81	28	27.29
	1759	ENDEAVOR	69	36.40	28	22.79
	2233	OCEANUS	69	21.94	28	16.19
860226	0008	ENDEAVOR	69	12.83	28	11.75
	1159	ENDEAVOR	69	23.00	28	15.21
	1402	OCEANUS	69	16.18	27	59.98
	1825	OCEANUS	69	29.38	27	40.36
	2306	ENDEAVOR	69	43.86	27	27.35
860227	0315	ENDEAVOR	69	43.94	27	09.06
	0557	OCEANUS	69	48.25	26	35.02
	1213	ENDEAVOR	69	48.66	26	55.91
	1926	ENDEAVOR	69	50.62	27	00.17
	2357	ENDEAVOR	69	48.58	27	09.05
860228	0016	OCEANUS	70	08.60	29	41.90
	0549	OCEANUS	69	22.59	28	49.08
	1156	OCEANUS	68	25.05	28	48.61
	1400	ENDEAVOR	68	41.37	29	10.54
	1748	OCEANUS	68	24.42	28	06.24
	2351	ENDEAVOR	68	31.40	28	32.70
860301	0554	OCEANUS	69	15.22	28	21.31
	1414	ENDEAVOR	68	23.59	28	22.91
860302	0008	ENDEAVOR	68	24.54	28	07.01
	0554	OCEANUS	68	24.66	28	58.81
	1449	ENDEAVOR	68	53.95	28	08.76
	1806	ENDEAVOR	69	02.73	28	10.55
860303	0010	ENDEAVOR	69	04.83	28	12.56
	0558	OCEANUS	68	34.19	28	46.45
	1157	ENDEAVOR	68	26.10	28	46.70
	1500	ENDEAVOR	68	28.22	28	57.64
	2054	ENDEAVOR	68	27.82	28	38.64
	2210	OCEANUS	68	34.80	28	37.87
	2359	ENDEAVOR	68	29.85	28	57.48
860304	0557	OCEANUS	68	14.71	28	36.52
	1114	ENDEAVOR	67	57.68	28	48.56
	1156	ENDEAVOR	67	59.86	28	44.93
	1310	ENDEAVOR	68	01.15	28	38.68
	1926	OCEANUS	68	14.29	28	23.36
	2348	OCEANUS	68	08.31	28	33.42
860305	0014	ENDEAVOR	68	03.02	29	29.44
	0542	OCEANUS	68	03.56	28	46.17
	0616	ENDEAVOR	67	51.10	28	53.00
	0952	OCEANUS	67	57.23	28	54.86
	1331	OCEANUS	67	54.77	29	00.13
	1952	OCEANUS	67	50.41	29	14.12
	2054	ENDEAVOR	67	46.56	29	42.65
860306	0005	ENDEAVOR	67	39.44	28	50.14
	0602	OCEANUS	68	34.00	28	06.60
	1151	OCEANUS	69	17.30	27	17.70
	1226	ENDEAVOR	67	35.44	28	48.04
	1757	OCEANUS	69	46.84	27	05.61
	2001	ENDEAVOR	67	30.19	28	42.00

Table Vb-2 (Cont)

SAS

DATE	TIME	SHIP	LOC
860307	0011	OCEANUS	69 33.98 27 08.04
	0014	ENDEAVOR	67 17.67 28 34.83
	0551	OCEANUS	70 02.76 26 54.31
	0606	ENDEAVOR	67 27.18 28 49.12
	1346	OCEANUS	69 33.96 27 18.29
	1609	OCEANUS	69 34.04 27 00.52
	1807	OCEANUS	69 43.73 26 54.14
	2026	OCEANUS	70 02.42 26 54.08
860308	0025	OCEANUS	70 02.06 27 22.57
	0611	OCEANUS	69 33.99 27 04.78
	1216	OCEANUS	69 51.21 26 27.90
	1756	OCEANUS	70 05.57 26 54.97
	2358	OCEANUS	69 50.37 27 07.88
860309	0637	OCEANUS	69 33.79 27 22.50
	1223	OCEANUS	69 39.60 28 19.90
	1849	OCEANUS	69 43.72 29 40.40
860310	0036	OCEANUS	69 49.57 30 57.14
	0612	OCEANUS	69 56.28 32 10.46
	1144	OCEANUS	70 04.25 33 21.84
	1740	OCEANUS	70 16.51 34 38.44

Table Vb-2 (Cont)

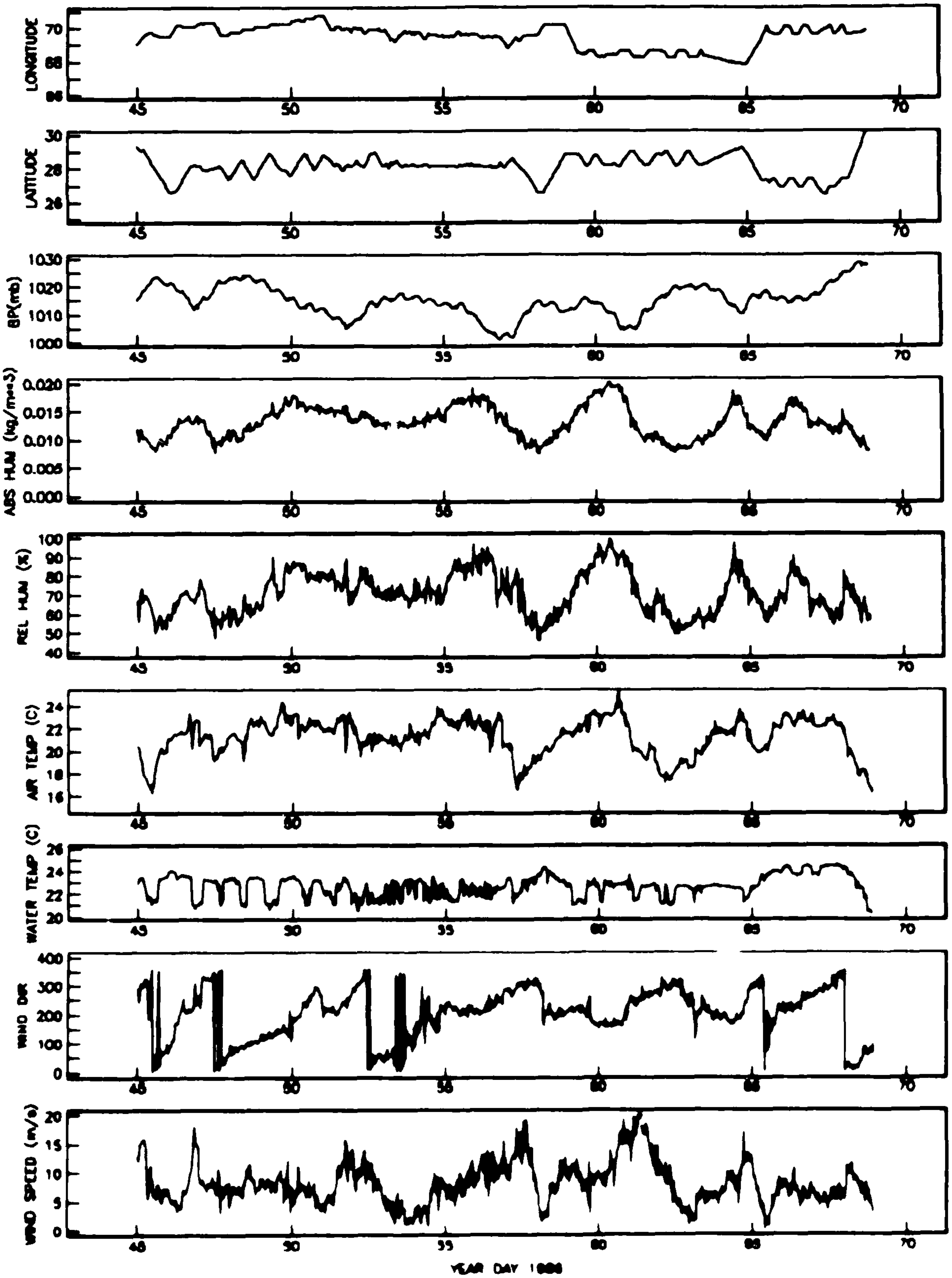


Figure Vb-3: Payne's Meteorological Plot for OCEANUS 175.

OCEANUS CRUISE 175 MANUAL MET OBSERVATIONS

NOTES ON PARAMETERS:

1. Date - Month/day
2. Time - UTC, hrmin
3. Lat and Long - Positions are from Internav Loran receiver.
4. WS,WD - True wind speed and direction derived from apparent wind speed and direction and ship course and speed. Direction is direction from which, meteorological convention.
5. AT - Dry bulb air temperature, from Assman psychrometer, thermometer divisions are 0.2C.
6. RH - Relative humidity computed from wet and dry bulb temperatures from Assman by equations and constants in Smithsonian Meteorological Tables.
7. ABS HUM - Absolute humidity in kg/m^3.
8. SST - Sea surface temperature (C) from bucket.
9. BP - Barometric pressure (mb) from bow MR for 2/14 0000Z to 2/21 1730Z. The remaining values are from the bridge corrected to agree with the bow MR.
10. CLOUD - Cloud observations. The four digits are: total octants covered, cloud type for low, medium and high clouds.
11. WAVES - The four two digit number· are: sea wave period and height, predominant swell direction and height. Heights in feet, dire. 'on in 10s of degrees.
12. SC,SS - Ship's course and speed (kt) from gyro and ship's speed log.
13. AD,AS - Apparent wind direction and speed. AD is from bridge readout of ship's wind vane. AS is whichever was considered the best value at the time of observation: ship's anemometer, SAIL anemometer, Davidson cups on met mast or, if cups not operational, Davidson hot wire anemometer on met mast. AS in kts. If SC,SS,AD,AS are all 0 then WS and WD are linearly interpolated values.
14. TW - Wet bulb temperature (C). If this 0 then AT,RH,AH are linearly interpolated values.

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES	SC	SS	AD	AS	TW
2/14	0	29 18.06	69 0.33	12.6	292	20.4	67.4	0.118E-01	22.9	1015.4			240	8	40	30	16.2
2/14	100	29 13.73	69 6.04	11.9	243	20.3	56.2	0.974E-02	23.4	1016.1			230	9	10	32	14.7
2/14	200	29 9.43	69 12.81	14.9	313	19.4	70.5	0.116E-01	23.4	1016.3			240	8	60	32	15.7
2/14	300	29 5.33	69 19.76	15.2	301	19.1	73.7	0.119E-01	23.5	1017.1			240	8	50	34	15.8
2/14	400	29 5.14	69 23.98	15.6	298	18.0	66.4	0.101E-01	23.1	1018.8			330	2	330	32	14.0
2/14	500	29 8.76	69 29.84	15.8	324	17.7	68.3	0.103E-01	22.6	1018.8			230	8	80	31	0.0
2/14	600	28 59.36	69 35.88	15.2	323	17.5	70.2	0.104E-01	22.1	1019.2			230	7	80	30	14.0
2/14	700	28 52.43	69 39.71	9.9	311	17.2	68.5	0.100E-01	21.4	1020.3			200	7	90	18	0.0
2/14	800	28 45.04	69 42.09	5.3	182	16.9	66.8	0.956E-02	21.8	1020.5			200	8	350	18	0.0
2/14	900	28 37.66	69 44.48	8.3	270	16.6	65.1	0.913E-02	21.8	1021.0			0	0	0	0	0.0
2/14	1000	28 30.27	69 46.86	11.2	357	16.3	63.4	0.872E-02	21.1	1021.4			190	8	160	14	12.2
2/14	1100	28 22.75	69 47.19	7.7	359	17.1	62.6	0.902E-02	21.1	1022.0	7	2 08 6	160	8	220	8	12.8
2/14	1200	28 15.62	69 45.00	8.7	2	16.8	59.6	0.843E-02	21.4	1023.1		2 04 8	160	8	220	10	12.2
2/14	1300	28 8.55	69 41.38	5.9	16	17.8	57.5	0.863E-02	21.6	1023.2	1	2 04 7	160	8	260	7	12.8
2/14	1400	27 59.64	69 37.77	6.3	19	18.6	50.5	0.794E-02	21.3	1023.3	4 1	2 24 10	160	8	260	8	12.6
2/14	1500	27 54.42	69 35.39	5.5	11	19.2	52.2	0.849E-02	21.4	1023.7	1 3	2 34 10	160	7	250	6	13.3
2/14	1600	27 47.81	69 33.07	8.0	354	19.6	55.9	0.931E-02	23.4	1023.3	4	2 34 9	160	8	210	8	14.1
2/14	1700	27 40.40	69 32.80	7.3	21	20.1	59.7	0.102E-01	23.3	1023.0	6	2 34 9	180	7	220	8	15.0
2/14	1800	27 32.90	69 32.50	5.1	75	20.3	58.4	0.101E-01	23.4	1022.4	8		180	8	300	11	15.0
2/14	1900	27 26.51	69 32.25	6.7	60	19.9	52.4	0.889E-02	23.4	1022.0	2		170	8	300	10	13.9
2/14	2000	27 19.69	69 30.67	7.0	66	19.8	57.0	0.960E-02	23.5	1021.4	8		170	8	290	14	14.4
2/14	2100	27 12.17	69 31.36	7.4	78	19.9	56.3	0.955E-02	23.5	1021.2	4		180	8	290	15	14.4
2/14	2200	27 5.60	69 32.48	6.3	85	20.0	52.6	0.896E-02	23.5	1021.1	41	1 32 10 6	180	8	300	14	14.0
2/14	2300	26 58.37	69 32.64	6.0	98	20.7	57.4	0.102E-01	23.5	1021.2	4	1 32 10 5	180	8	310	15	15.2
2/15	0	26 51.11	69 32.07	7.4	68	21.2	60.4	0.110E-01	24.0	1020.8			170	8	290	15	16.0
2/15	100	26 44.03	69 31.33	6.4	90	21.1	59.5	0.108E-01	24.0	1021.0			170	8	310	16	15.8
2/15	200	26 37.09	69 30.86	5.1	89	21.0	57.0	0.103E-01	24.1	1021.6			270	8	180	2	15.4
2/15	300	26 37.29	69 38.74	4.6	116	21.3	60.5	0.111E-01	24.0	1021.3			270	8	270	4	16.1
2/15	400	26 37.70	69 47.04	5.5	109	21.5	66.2	0.123E-01	24.0	1020.9			270	8	240	4	17.0
2/15	500	26 37.95	69 56.02	4.4	173	21.6	61.6	0.115E-01	23.7	1020.2			270	8	310	11	16.5
2/15	600	26 38.22	70 4.28	5.5	169	21.4	66.9	0.123E-01	23.3	1019.3			270	8	300	12	17.0
2/15	700	26 43.38	70 8.54	3.3	170	21.5	64.6	0.120E-01	23.5	1018.5			0	8	30	2	16.8
2/15	800	26 49.12	70 7.78	4.4	200	21.5	74.2	0.130E-01	23.5	1018.5			0	8	270	3	18.0
2/15	900	26 57.24	70 8.11	4.2	209	21.8	70.5	0.133E-01	23.6	1018.3			0	7	270	4	17.8
2/15	1000	27 5.04	70 7.49	3.7	226	21.6	70.3	0.131E-01	23.7	1017.9			0	8	300	6	17.6
2/15	1100	27 12.80	70 6.97	7.0	236	21.6	71.9	0.134E-01	23.5	1018.5	2	1 35 9 4	0	8	290	14	17.8
2/15	1200	27 20.99	70 6.68	6.2	228	21.5	71.8	0.133E-01	23.5	1017.9	1	1 35 9 4	0	8	270	9	17.7
2/15	1300	27 29.06	70 6.32	6.7	214	21.6	71.1	0.133E-01	23.6	1017.4		1 35 9 3	0	8	250	8	17.7
2/15	1400	27 37.23	70 6.08	6.3	205	21.7	72.8	0.137E-01	23.5	1016.8	1	1 3	0	8	240	6	18.0
2/15	1500	27 45.27	70 5.80	7.1	209	22.0	70.7	0.135E-01	23.6	1016.2	1	2 3	0	8	240	8	18.0
2/15	1600	27 53.14	70 5.09	8.1	221	23.4	69.0	0.162E-01	23.4	1016.1	2	2 3	0	8	250	11	19.0
2/15	1700	28 0.91	70 3.83	9.9	208	22.4	68.0	0.133E-01	23.5	1014.2	2		350	8	240	14	18.0
2/15	1800	28 8.76	70 2.80	10.4	218	20.2	67.8	0.131E-01	21.1	1013.6			350	8	250	16	0.0
2/15	1900	28 13.29	70 4.32	14.5	218	22.0	67.6	0.129E-01	21.1	1012.9	2		240	2	340	30	17.6
2/15	2000	28 12.53	70 6.61	18.0	309	22.8	65.4	0.130E-01	20.7	1011.9	1		330	0	340	35	18.0
2/15	2100	28 13.74	70 4.53	14.9	232	22.8	68.5	0.137E-01	21.1	1012.1			20	6	220	24	0.0
2/15	2200	28 12.26	70 9.69	14.9	249	22.8	71.5	0.143E-01	21.1	1013.8	2	2 25 6 6	250	6	0	35	18.8
2/15	2300	28 10.62	70 12.85	13.9	259	22.6	69.8	0.138E-02	21.1	1012.4	2	2 26 5 6	270	2	350	29	18.4
2/16	0	28 10.09	70 13.86	9.8	269	20.4	74.1	0.129E-01	21.3	1013.3			270	3	0	22	17.0
2/16	100	28 10.63	70 15.50	8.4	234	20.7	78.6	0.139E-01	21.3	1014.1			200	4	20	20	17.8
2/16	200	28 10.44	70 17.90	8.1	331	21.0	74.6	0.135E-01	21.2	1014.8			270	4	50	18	17.6
2/16	300	28 2.82	70 17.12	8.9	333	21.0	73.8	0.133E-01	23.4	1015.9			180	9	130	10	17.5
2/16	400	27 54.46	70 16.94	7.7	329	21.5	72.6	0.135E-01	23.3	1016.7		2 30 6	330	1	0	16	17.8
2/16	500	27 55.40	70 17.07	7.7	319	21.5	66.2	0.123E-01	23.3	1015.7			320	1	0	16	17.0
2/16	600	27 56.49	70 17.36	6.7	329	21.2	62.0	0.113E-01	23.2	1015.9			330	2	0	15	16.2
2/16	700	27 57.37	70 17.30	8.2	319	21.2	60.4	0.110E-01	23.1	1015.8			330	1	350	17	16.0
2/16	800	27 58.41	70 17.49	7.7	[illegible]	21.5	62.3	0.116E-01	23.2	1016.3			330	2	350	17	16.5
2/16	900	27 58.28	70 17.23	7.7	329	21.0	57.9	0.104E-01	23.1	1017.1			330	1	0	16	15.5

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES		SC	SS	AD	AS	TV
2/16	1000	27 59.91	70 17.47	9.3	351	19.4	53.4	0.879E-02	23.0	1017.7				330	1	20	19	13.6
2/16	1030	28 0.42	70 17.66	7.7	341	19.6	52.9	0.880E-02	23.0	1017.8	1	1 30	4	330	2	10	17	13.7
2/16	1100	28 0.85	70 17.90	8.5	14	19.3	62.8	0.103E-01	23.1	1018.3	1	1 30	3	330	2	40	18	14.7
2/16	1130	28 1.27	70 18.15	8.3	351	19.1	64.3	0.104E-01	23.1	1018.6	1	1 30	3	340	2	10	18	14.7
2/16	1200	28 1.97	70 18.47	7.7	1	19.3	54.8	0.897E-02	23.2	1019.2	1	1 32	5	350	2	10	17	13.7
2/16	1230	28 2.57	70 18.19	7.8	12	19.5	47.3	0.783E-02	23.2	1020.0	1	1 32	5	350	2	20	17	12.9
2/16	1300	28 4.04	70 13.47	6.7	12	19.5	59.0	0.977E-02	23.2	1019.8	1	1 34	5	70	12	330	22	14.4
2/16	1330	28 5.77	70 6.79	6.4	19	19.5	57.7	0.954E-02	22.4	1020.5				0	0	0	0	0.0
2/16	1400	28 4.11	70 4.62	6.1	25	19.4	56.4	0.930E-02	22.8	1021.1	1	1 32	5	150	5	260	10	14.0
2/16	1430	28 3.79	70 4.87	8.4	14	19.9	55.9	0.945E-02	22.9	1021.5				0	0	0	0	0.0
2/16	1500	28 5.31	69 56.53	10.7	357	20.3	55.3	0.959E-02	22.5	1021.8	1	3 00	5	65	8	310	25	14.6
2/16	1530	28 7.19	69 57.55	9.6	9	20.1	56.6	0.970E-02	21.0	1022.2				0	0	0	0	0.0
2/16	1600	28 9.02	69 47.18	8.5	16	19.9	57.9	0.981E-02	21.0	1022.5	1	3 00	4	60	8	330	23	14.6
2/16	1630	28 10.83	69 43.02	3.0	359	20.5	54.0	0.948E-02	21.1	1022.1				60	8	335	12	14.6
2/16	1700	28 12.71	69 38.99	7.0	53	20.0	52.6	0.896E-02	21.4	1021.9	1	3	4	180	8	270	11	14.0
2/16	1730	28 12.20	69 35.38	7.0	56	20.0	52.6	0.896E-02	21.3	1021.7				0	0	0	0	14.0
2/16	1800	28 8.27	69 34.91	6.9	58	20.2	55.2	0.951E-02	21.4	1021.5	1	1	2	190	9	270	10	14.5
2/16	1830	28 4.51	69 34.71	7.7	34	20.0	62.0	0.106E-01	23.0	1021.6				195	8	220	8	15.2
2/16	1900	28 0.81	69 35.09	5.7	26	20.2	57.5	0.992E-02	23.4	1021.4	1	1	4	190	8	230	4	14.8
2/16	1930	27 56.76	69 35.58	6.0	29	20.3	57.7	0.100E-01	23.3	1021.5				0	0	0	0	0.0
2/16	2000	27 53.35	69 35.56	6.3	32	20.4	57.8	0.101E-01	23.3	1021.6	1	1	4	180	8	250	7	15.0
2/16	2030	27 49.45	69 35.85	7.2	41	20.5	58.7	0.103E-01	23.2	1021.7				0	0	0	0	0.0
2/16	2100	27 44.72	69 36.10	8.0	49	20.6	59.6	0.105E-01	23.1	1021.8	1	1	4	180	8	260	12	15.4
2/16	2130	27 42.00	69 36.06	7.6	57	21.0	59.7	0.108E-01	23.3	1021.7				0	0	0	0	0.0
2/16	2200	27 38.10	69 35.84	7.2	65	21.3	59.7	0.110E-01	23.4	1022.3	2	2 09	3	180	8	280	13	16.0
2/16	2230	27 34.24	69 35.68	7.7	63	21.3	62.4	0.115E-01	23.4	1022.3				0	0	0	0	0.0
2/16	2300	27 30.42	69 35.57	8.3	60	21.3	65.1	0.119E-01	23.3	1022.3	2	2 09	3	180	8	270	14	16.7
2/16	2330	27 26.72	69 35.88	6.1	78	21.3	59.4	0.109E-01	23.3	1022.6				0	0	0	0	0.0
2/17	0	27 24.07	69 37.86	3.8	95	21.3	53.6	0.984E-02	23.5	1022.9	1			270	8	310	1	15.2
2/17	30	27 24.50	69 42.25	4.6	95	21.5	54.2	0.100E-01	23.4	1023.1				0	0	0	0	0.0
2/17	100	27 35.31	69 46.63	5.4	95	21.6	54.8	0.102E-01	23.5	1023.3	1			0	7	60	12	15.6
2/17	130	27 29.36	69 46.56	6.1	79	21.6	58.5	0.109E-01	23.3	1023.2				0	0	0	0	0.0
2/17	200	27 33.46	69 46.10	6.7	63	21.5	62.2	0.115E-01	23.4	1023.0	1			0	8	40	18	16.5
2/17	230	27 37.37	69 45.54	7.3	68	21.6	62.7	0.117E-01	23.5	1023.1				0	0	0	0	0.0
2/17	300	27 41.28	69 45.24	7.8	73	21.7	63.2	0.119E-01	23.4	1023.3	1			0	8	50	19	16.8
2/17	330	27 45.29	69 44.80	7.3	83	21.5	62.7	0.117E-01	23.2	1023.4				0	0	0	0	0.0
2/17	400	27 49.04	69 44.91	6.7	92	21.4	62.1	0.115E-01	22.9	1023.5				0	8	60	15	16.4
2/17	430	27 52.67	69 44.72	6.5	88	21.2	58.8	0.112E-01	23.0	1023.4				0	0	0	0	0.0
2/17	500	27 56.54	69 45.12	6.3	84	21.0	55.5	0.100E-01	23.1	1023.3				350	8	60	14	15.2
2/17	530	28 0.29	69 45.21	6.7	82	21.0	54.8	0.987E-02	23.1	1023.3				0	0	0	0	0.0
2/17	600	28 4.22	69 45.27	7.1	79	21.0	54.0	0.974E-02	23.2	1023.2				350	8	60	16	15.0
2/17	630	28 7.79	69 44.93	6.4	69	21.0	55.5	0.100E-01	23.0	1023.0				350	8	50	16	15.2
2/17	700	28 11.45	69 44.44	7.9	89	21.0	55.5	0.100E-01	22.9	1022.8				350	8	70	16	15.2
2/17	730	28 14.91	69 44.32	7.7	91	21.0	57.8	0.104E-01	22.0	1022.9				340	8	80	14	15.5
2/17	800	28 18.56	69 45.55	6.1	89	20.8	56.7	0.101E-01	21.1	1022.8				340	8	70	12	15.2
2/17	830	28 22.15	69 46.17	6.3	94	20.8	58.3	0.104E-01	21.1	1022.5				0	8	60	14	15.4
2/17	900	28 25.97	69 46.12	6.7	92	20.8	56.7	0.101E-01	21.1	1022.7				0	8	60	15	15.2
2/17	930	28 29.49	69 45.82	5.8	97	20.5	57.1	0.100E-01	21.0	1022.8				0	8	60	13	15.0
2/17	1000	28 30.28	69 49.82	5.7	39	19.1	64.2	0.104E-01	21.0	1023.2				270	8	180	3	14.7
2/17	1030	28 30.41	69 54.50	7.3	86	19.6	67.6	0.113E-01	21.2	1024.1				0	0	0	0	0.0
2/17	1100	28 27.08	69 55.84	8.8	83	20.0	71.0	0.121E-01	21.0	1023.2	4			180	8	290	18	16.3
2/17	1130	28 23.16	69 55.97	7.6	91	20.2	69.6	0.120E-01	20.9	1023.6	6	1 09	3	180	8	300	17	16.3
2/17	1200	28 29.38	69 56.29	8.0	93	21.4	64.4	0.119E-01	20.8	1023.8	6	1 09	3	180	8	300	18	16.7
2/17	1230	28 15.37	69 55.69	9.0	96	21.1	64.9	0.118E-01	21.0	1023.9	8	1 09	3	180	8	300	20	16.5
2/17	1300	28 11.55	69 54.86	10.4	99	21.1	65.7	0.119E-01	23.1	1023.5	8	1 09	3	180	8	300	23	16.6
2/17	1330	28 7.94	69 55.06	9.7	106	22.0	60.5	0.116E-01	23.2	1023.8	1	1 09	3	200	8	290	20	16.7
2/17	1400	28 4.31	69 55.63	10.4	99	22.2	64.6	0.125E-01	23.3	1023.9	1	3 01	5	180	8	300	23	17.4
2/17	1430	28 0.77	69 55.78	11.1	89	22.7	61.3	0.122E-01	23.5	1024.2	1	3 01	5	180	8	290	23	17.4
2/17	1500	27 56.96	69 55.81	11.3	95	22.7	63.6	0.127E-01	23.5	1024.1				0	0	0	0	0.0
2/17	1530	27 53.25	69 55.72	11.4	101	22.7	65.9	0.131E-01	23.5	1024.0	1	4 01	5	180	8	300	25	18.0
2/17	1600	27 49.65	69 55.64	8.8	108	23.0	58.0	0.117E-01	23.4	1024.2	1	4 01	5	180	8	310	21	17.2
2/17	1630	27 45.00	69 55.60	9.0	96	22.5	59.6	0.117E-01	23.5	1023.6	1	4 10	5	180	8	300	20	17.0
2/17	1700	27 41.65	69 55.65	9.2	100	22.6	60.5	0.119E-01	23.5	1023.5	1	4 10	5	170	8	310	22	17.2
2/17	1730	27 37.66	69 55.60	8.3	107	22.4	61.8	0.121E-01	23.4	1023.1	1	3 10	4	180	8	310	20	17.2
2/17	1800	27 35.17	69 55.63	8.3	107	22.2	61.5	0.119E-01	23.4	1022.6	1	3 10	4	180	8	310	20	17.0
2/17	1830	27 31.55	69 55.62	8.3	107	22.4	62.5	0.122E-01	23.4	1022.4	1	3 10	4	180	8	310	20	17.3
2/17	1900	27 27.88	69 55.84	8.8	108	22.4	60.3	0.118E-01	23.4	1022.2	1	2 12	4	180	8	310	21	17.0
2/17	1930	27 24.55	69 56.65	7.8	106	22.4	61.8	0.121E-01	23.5	1022.3	1	2 12	4	180	8	310	19	17.2
2/17	2000	27 24.15	70 2.09	6.1	108	22.4	64.0	0.125E-01	23.5	1022.1	1	2 12	4	270	8	230	5	17.5
2/17	2030	27 25.45	70 6.08	6.8	105	22.6	65.4	0.129E-01	23.5	1021.9				0	0	0	0	0.0
2/17	2100	27 29.77	70 6.48	7.4	101	22.8	66.8	0.133E-01	23.5	1021.7	1 9	3 00	6	0	8	70	15	18.2
2/17	2130	27 34.04	70 6.42	7.7	102	22.5	65.3	0.128E-01	23.5	1021.8				0	0	0	0	0.0
2/17	2200	27 38.94	70 6.72	7.0	103	22.2	63.8	0.123E-01	23.4	1021.8	1	3 00	6	0	8	70	14	17.3
2/17	2230	27 42.76	70 6.02	7.1	109	22.5	64.5	0.126E-01	23.4	1022.0				0	0	0	0	0.0
2/17	2300	27 47.00	70 5.56	7.2	114	22.7	65.1	0.129E-01	23.4	1022.1	5			0	8	80	13	17.9
2/17	2330	27 51.25	70 5.48	7.6	132	22.9	63.1	0.127E-01	23.4	1022.5				0	8	100	11	17.8
2/18	0	27 55.70	70 5.34	9.0	135	23.1	61.8	0.126E-01	23.4	1022.4				0	8	110	13	17.8
2/18	30	28 0.02	70 5.24	8.1	128	22.8	63.0	0.126E-01	23.3	1022.5				350	8	110	11	17.7
2/18	100	28 4.20	70 5.52	8.0	120	22.7	63.6	0.124E-01	23.3	1022.5				350	8	100	12	17.7
2/18	130	28 8.43	70 5.57	9.0	135	22.7	64.4	0.128E-01	23.2	1022.5				0	8	110	13	17.8
2/18	200	28 12.58	70 4.95	8.3	109	22.7	69.7	0.138E-01	23.0	1022.7				350	8	90	14	18.5
2/18	230	28 16.71	70 4.80	7.6	122	22.4	70.2	0.137E-01	21.8	1022.6				350	8	100	11	18.3
2/18	300	28 20.53	70 5.29	8.0	115	22.7	70.5	0.140E-01	21.3	1022.6				345	8	100	12	18.6
2/18	330	28 24.18	70 5.82	7.0	116	22.0	76.3	0.146E-01	21.2	1022.4				350	8	90	11	18.7
2/18	400	28 27.93	70 6.31	7.0	126	22.2	72.4	0.140E-01	21.1	1021.9				0	8	90	11	18.4
2/18	430	28 31.57	70 5.91	8.0	130	21.8	76.1	0.144E-01	21.2	1021.5				0	8	100	12	18.5

Table Vb-3 (Cont)

DATE	TIME	LAT		LONG		WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES				SC	SS	AD	AS	TV
2/18	500	28	35.28	70	5.90	8.9	127	21.8	76.1	0.144E-01	21.2	1021.0						0	8	100	14	18.5
2/18	530	28	39.15	70	5.80	9.0	143	21.6	78.4	0.146E-01	21.2	1020.9						0	8	120	12	18.6
2/18	600	28	44.72	70	6.00	8.5	127	21.5	78.3	0.145E-01	21.1	1020.5						350	8	110	12	18.5
2/18	630	28	40.74	70	5.81	8.0	120	21.5	77.5	0.144E-01	20.6	1020.0						350	8	100	12	18.4
2/18	700	28	51.94	70	5.92	8.1	128	21.5	78.3	0.145E-01	21.0	1020.0						350	8	110	11	18.5
2/18	730	28	54.61	70	6.26	8.5	134	21.4	78.3	0.144E-01	21.1	1019.9						350	8	120	11	18.4
2/18	800	28	55.02	70	10.04	6.3	122	21.4	80.0	0.148E-01	20.9	1019.2						270	8	250	7	18.6
2/18	830	28	53.73	70	15.59	8.0	135	21.5	80.9	0.150E-01	21.0	1018.8	1					180	8	330	22	18.8
2/18	900	28	51.79	70	15.56	8.6	122	21.5	82.6	0.153E-01	21.4	1018.5						180	8	320	22	19.0
2/18	930	28	47.98	70	15.67	7.0	132	21.4	90.4	0.167E-01	21.6	1018.5						180	8	330	20	19.8
2/18	1000	28	44.07	70	15.54	8.0	135	22.1	79.7	0.153E-01	21.6	1018.5						180	8	330	22	19.2
2/18	1030	28	39.92	70	15.67	7.5	134	21.9	76.2	0.145E-01	21.4	1018.4						180	8	330	21	18.6
2/18	1100	28	35.88	70	15.84	7.1	148	22.2	74.9	0.144E-01	21.1	1018.5	1 9	2			0	180	8	340	21	18.7
2/18	1130	28	31.93	70	15.79	6.5	131	22.1	75.6	0.145E-01	21.0	1018.6	6	2			0	180	8	330	19	18.7
2/18	1200	28	28.12	70	16.20	7.1	148	22.2	75.7	0.146E-01	21.0	1018.5	6	3			0	180	8	340	21	18.8
2/18	1230	28	24.19	70	16.07	6.6	147	22.5	71.2	0.140E-01	21.1	1018.6	6	3			0	180	8	340	20	18.5
2/18	1300	28	21.62	70	15.99	8.9	155	22.7	71.4	0.142E-01	21.1	1019.1	6	3			0	180	4	340	21	18.7
2/18	1330	28	18.21	70	16.03	9.5	137	23.2	67.2	0.137E-01	22.1	1018.9	5 7	3			0	180	8	330	25	18.6
2/18	1400	28	15.16	70	16.14	9.6	148	23.3	71.2	0.146E-01	22.6	1019.0	178	3			0	180	5	335	23	19.2
2/18	1430	28	11.63	70	15.62	9.1	151	23.4	71.3	0.147E-01	22.8	1019.0	178	3			0	180	8	340	25	19.3
2/18	1500	28	7.77	70	15.42	9.8	144	23.6	69.2	0.144E-01	23.2	1019.0	17	4			0	180	8	335	26	19.2
2/18	1530	28	4.07	70	15.38	10.4	140	24.2	72.0	0.155E-01	23.4	1018.7	2 8	4			0	180	7	330	26	20.1
2/18	1600	28	0.04	70	15.95	8.5	141	24.4	69.2	0.151E-01	23.4	1018.6	2 8	4			0	185	8	330	23	19.9
2/18	1630	27	59.24	70	16.13	8.6	150	24.3	70.7	0.153E-01	23.4	1018.1						0	0	0	0	0.0
2/18	1700	27	58.77	70	15.95	8.7	160	24.2	72.1	0.155E-01	23.4	1017.7	2	4			0	0	0	0	0	20.1
2/18	1730	27	58.65	70	15.95	8.8	169	24.0	72.6	0.155E-01	23.2	1017.5	7	4			3	170	1	0	18	20.0
2/18	1800	27	58.42	70	16.02	4.7	147	23.4	73.6	0.152E-01	23.1	1017.6	3	1			3	170	1	340	10	19.6
2/18	1830	27	58.33	70	15.88	5.2	159	23.2	79.8	0.163E-01	23.2	1017.1	3	1	18		3	170	1	350	11	20.2
2/18	1900	27	58.41	70	15.60	6.7	139	22.5	85.0	0.167E-01	23.3	1016.5	3					150	1	350	14	20.2
2/18	1930	27	58.49	70	15.31	5.7	139	23.4	84.9	0.175E-01	23.3	1016.3	3					150	1	350	12	21.0
2/18	2000	27	58.55	70	14.97	5.7	149	23.0	87.9	0.177E-01	23.3	1016.3	3					150	1	0	12	21.0
2/18	2030	27	58.12	70	14.28	9.0	137	22.8	85.3	0.170E-01	23.4	1015.8						0	0	0	0	0.0
2/18	2100	27	56.23	70	13.71	12.2	124	22.6	82.6	0.163E-01	23.5	1015.4	8					190	8	310	28	20.0
2/18	2130	27	52.88	70	14.71	7.6	129	22.6	86.0	0.170E-01	23.5	1015.8	7	2	16		4	190	8	320	20	20.4
2/18	2200	27	49.46	70	15.68	6.6	147	23.3	81.5	0.167E-01	23.5	1015.3	7	3	16		4	180	8	340	20	20.5
2/18	2230	27	45.85	70	15.83	7.8	217	22.4	81.6	0.159E-01	23.5	1016.1	7	3	16		4	180	8	25	22	19.7
2/18	2300	27	42.26	70	15.92	7.0	132	22.5	82.5	0.162E-01	23.4	1015.5	7	3	16		4	180	8	330	20	19.9
2/18	2330	27	38.60	70	15.72	2.9	105	22.3	83.2	0.162E-01	23.4	1016.0	7					180	8	330	11	19.8
2/19	0	27	35.30	70	15.69	6.1	180	22.6	86.0	0.170E-01	23.6	1015.8						230	8	330	18	20.4
2/19	30	27	35.02	70	19.59	7.7	192	22.5	85.1	0.167E-01	23.5	1015.8						270	9	310	19	20.2
2/19	100	27	35.78	70	23.85	6.9	192	23.1	87.2	0.177E-01	23.6	1016.1	2					270	8	310	17	21.0
2/19	130	27	38.43	70	26.45	5.2	189	23.2	88.1	0.180E-01	23.6	1016.2	2					0	9	240	2	21.2
2/19	200	27	42.88	70	26.20	4.5	184	23.3	86.5	0.177E-01	23.6	1016.2	2					0	8	220	1	21.1
2/19	230	27	47.47	70	25.91	5.7	186	23.4	84.9	0.175E-01	23.4	1016.0	2					350	8	230	4	21.0
2/19	300	27	51.72	70	26.30	4.7	180	23.3	86.5	0.177E-01	23.2	1015.5	2					350	8	240	2	21.1
2/19	330	27	55.82	70	26.28	7.1	188	23.3	86.5	0.177E-01	23.2	1015.3	2					0	8	200	6	21.1
2/19	400	27	59.77	70	26.29	6.5	191	23.2	87.2	0.178E-01	23.2	1015.0	7					0	8	210	5	21.1
2/19	430	28	3.78	70	26.78	6.1	186	23.2	86.4	0.176E-01	23.3	1014.5	7					0	8	200	4	21.0
2/19	500	28	3.56	70	27.26	11.3	196	21.0	86.6	0.156E-01	23.3	1013.9	7					10	8	190	14	19.0
2/19	530	28	9.16	70	27.74	10.2	195	21.3	86.8	0.159E-01	23.1	1013.7						0	0	0	0	0.0
2/19	600	28	14.16	70	28.22	9.1	194	21.5	87.0	0.161E-01	23.0	1013.6						0	0	0	0	0.0
2/19	630	28	20.36	70	28.70	8.0	193	21.8	87.2	0.164E-01	22.9	1013.4	53					340	8	240	10	19.8
2/19	700	28	23.39	70	28.49	6.7	194	22.0	87.3	0.167E-01	22.9	1012.7	3					340	8	250	8	20.0
2/19	730	28	27.01	70	28.41	7.4	207	22.2	84.9	0.164E-01	22.9	1012.4						0	0	0	0	0.0
2/19	800	28	30.62	70	28.32	8.0	219	22.4	82.5	0.161E-01	22.4	1012.2						350	8	260	12	19.8
2/19	830	28	33.57	70	25.86	7.4	248	22.2	84.0	0.162E-01	21.8	1012.3	2					350	8	290	15	19.8
2/19	900	28	37.28	70	26.26	7.7	238	22.0	87.3	0.167E-01	21.8	1012.3						350	8	280	14	20.0
2/19	930	28	41.16	70	26.16	7.9	228	22.0	87.3	0.167E-01	22.4	1012.2						350	8	270	13	20.0
2/19	1000	28	44.92	70	25.88	7.4	248	21.7	85.4	0.160E-01	20.9	1012.5						350	8	290	15	19.5
2/19	1030	28	48.73	70	25.73	6.6	243	21.7	86.2	0.162E-01	21.2	1012.6						350	8	290	13	19.6
2/19	1100	28	52.46	70	25.77	7.3	234	22.1	82.3	0.158E-01	21.0	1012.8	5					310	8	310	18	19.5
2/19	1130	28	52.76	70	29.54	5.6	225	22.0	78.9	0.150E-01	21.1	1012.4	6					260	8	340	18	19.0
2/19	1200	28	52.28	70	33.86	6.2	229	22.0	78.9	0.150E-01	21.0	1012.4	6					230	8	0	20	19.0
2/19	1230	28	48.85	70	34.56	6.2	255	22.4	77.5	0.151E-01	21.1	1012.9	6	2				190	8	40	17	19.2
2/19	1300	28	45.04	70	34.77	7.3	255	22.7	77.0	0.153E-01	21.9	1013.5	4	2				180	8	50	18	19.4
2/19	1330	28	52.48	70	31.77	7.3	255	22.7	79.4	0.158E-01	21.0	1013.6	8	3				180	8	50	18	19.7
2/19	1400	28	37.15	70	34.87	8.5	269	23.0	77.3	0.156E-01	22.5	1013.6	5	3				185	8	60	19	19.7
2/19	1430	28	33.15	70	35.22	5.7	247	22.3	82.4	0.160E-01	21.8	1013.7	5	3				180	8	40	16	19.7
2/19	1500	28	29.50	70	35.43	6.7	272	22.7	79.4	0.158E-01	21.8	1013.8	5	3				180	8	60	15	19.7
2/19	1530	28	25.64	70	34.88	6.7	272	22.7	81.1	0.161E-01	23.0	1014.1	5	3				180	8	60	15	19.9
2/19	1600	28	21.92	70	34.41	6.7	272	22.5	80.9	0.159E-01	23.0	1013.8	5	3				180	8	60	15	19.7
2/19	1630	28	18.13	70	34.52	6.7	272	22.7	79.4	0.158E-01	23.2	1013.7	4	3				180	8	60	15	19.7
2/19	1700	28	14.25	70	34.56	7.1	269	22.8	78.7	0.157E-01	23.1	1013.4	4	3				180	8	60	16	19.7
2/19	1730	28	16.35	70	34.35	7.9	301	22.2	80.7	0.156E-01	23.1	1012.8	4	3	23	5	4	180	8	90	13	19.4
2/19	1800	28	6.48	70	34.43	8.3	299	22.4	80.0	0.156E-01	23.1	1012.2	4	3	23	5	4	180	8	90	14	19.5
2/19	1830	28	2.61	70	34.54	7.2	294	22.4	79.2	0.155E-01	23.2	1012.3	4					180	8	80	13	19.4
2/19	1900	27	58.24	70	34.89	3.7	291	22.3	78.3	0.152E-01	23.3	1011.8	4					270	8	10	15	19.2
2/19	1930	27	58.65	70	39.42	5.0	293	22.6	78.9	0.156E-01	23.2	1011.5						0	0	0	0	0.0
2/19	2000	27	59.06	70	43.95	6.2	294	22.8	79.5	0.159E-01	23.1	1011.2	4					0	8	320	17	19.8
2/19	2030	28	2.99	70	44.16	5.7	292	22.6	82.7	0.163E-01	23.1	1011.1	1	2				0	8	320	16	20.0
2/19	2100	28	7.12	70	44.08	4.8	286	22.6	82.7	0.163E-01	23.1	1011.2	2	2				0	8	320	14	20.0
2/19	2130	28	11.22	70	43.86	4.4	283	22.5	78.5	0.154E-01	23.2	1011.6	1	2				0	8	320	13	19.4
2/19	2200	28	15.37	72	43.57	4.4	263	22.2	77.4	0.149E-01	23.1	1011.6	1	2				0	8	310	11	19.0
2/19	2230	28	19.45	70	43.19	3.6	273	22.0	76.4	0.146E-01	22.9	1012.0	1	2				0	8	320	11	18.7
2/19	2300	28	23.68	70	42.86	3.3	266	22.2	82.3	0.159E-01	22.5	1012.2	1	2				0	8	320	10	19.6
2/19	2330	28	27.65	70	42.75	3.9	223	22.0	80.5	0.154E-01	22.6	1012.2	1					350	8	300	7	19.2

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES	SC	SS	AD	AS	TV
2/20	0	28 31.76	70 43.11	4.4	227	21.9	81.3	0.154E-01	22.1	1012.3	1		350	8	295	8	19.2
2/20	30	28 35.79	70 43.54	4.6	196	21.7	82.8	0.155E-01	22.3	1012.4	1		350	8	270	4	19.2
2/20	100	28 39.59	70 43.57	4.6	189	21.7	82.8	0.155E-01	22.0	1012.1	2		350	8	260	3	19.2
2/20	130	28 43.51	70 43.46	4.0	206	21.9	79.6	0.151E-01	22.1	1012.2	2		350	8	290	5	19.0
2/20	200	28 47.50	70 44.21	4.1	229	21.8	82.0	0.155E-01	22.0	1012.2	2		350	8	300	8	19.2
2/20	230	28 50.33	70 42.49	3.0	220	21.8	80.4	0.152E-01	21.8	1012.1	2		120	8	40	9	19.0
2/20	300	28 48.55	70 38.25	5.1	224	21.9	78.8	0.149E-01	22.3	1011.9	2		120	8	60	11	18.9
2/20	330	28 46.69	70 34.02	4.7	211	21.9	78.8	0.149E-01	22.3	1011.6	25		120	8	50	12	18.9
2/20	400	28 44.72	70 29.55	5.8	217	22.0	78.9	0.150E-01	22.2	1010.9	25		120	8	60	13	19.0
2/20	430	28 42.62	70 25.26	5.1	224	22.2	77.4	0.149E-01	22.2	1011.1	15		120	8	60	11	19.0
2/20	500	28 40.47	70 21.01	6.3	214	21.8	82.1	0.155E-01	22.2	1010.8	15		120	8	60	14	19.2
2/20	530	28 38.26	70 16.53	6.0	216	21.9	81.0	0.154E-01	22.3	1010.5			0	0	0	0	0.0
2/20	600	28 36.21	70 12.02	5.8	218	21.9	80.0	0.152E-01	22.1	1010.3			0	0	0	0	0.0
2/20	615	28 35.32	70 10.83	5.5	220	22.0	78.9	0.151E-01	21.7	1010.0	12	2	120	8	60	12	19.0
2/20	630	28 34.47	70 8.77	5.7	214	22.0	78.9	0.151E-01	21.8	1009.8			0	0	0	0	0.0
2/20	700	28 32.64	70 4.08	5.8	207	22.0	78.9	0.151E-01	21.8	1009.5	1	2	110	8	60	13	19.0
2/20	730	28 30.14	70 0.97	4.7	219	21.8	83.8	0.158E-01	21.7	1009.5	5	2	110	8	60	10	19.4
2/20	800	28 29.16	69 56.70	6.0	232	21.8	83.8	0.158E-01	21.1	1009.2	5	2	110	8	80	10	19.4
2/20	830	28 27.56	69 55.44	5.2	221	21.5	82.7	0.153E-01	21.1	1008.8	5	2 4	210	2	10	12	19.0
2/20	900	28 26.25	69 56.25	4.1	220	21.6	81.9	0.153E-01	21.1	1008.5	5	2 4	180	8	20	15	19.0
2/20	930	28 20.80	69 55.86	6.6	212	21.8	80.4	0.152E-01	21.1	1008.4	5		180	8	20	20	19.0
2/20	1000	28 17.80	69 55.76	6.3	196	22.2	75.8	0.146E-01	21.1	1008.7			180	8	10	20	18.8
2/20	1030	28 14.00	69 55.06	6.8	196	22.4	72.0	0.140E-01	22.6	1008.9	17		180	8	10	21	18.5
2/20	1100	28 11.93	69 56.86	8.1	200	22.6	77.0	0.152E-01	23.0	1008.8	1 2	2 00 8 3	270	12	320	23	19.3
2/20	1130	28 12.19	70 2.33	10.5	200	23.0	75.7	0.153E-01	22.9	1008.8	1 8	2	270	12	315	27	19.5
2/20	1200	28 13.52	70 6.00	9.3	207	22.6	77.0	0.152E-01	22.5	1009.2	19	2	0	6	220	13	19.3
2/20	1230	28 16.27	70 5.01	11.5	205	22.6	77.8	0.153E-01	22.5	1009.5	22	2	350	3	220	20	19.4
2/20	1300	28 18.68	70 4.10	10.6	206	22.6	77.0	0.152E-01	22.3	1009.5	22	3	350	2	220	19	19.3
2/20	1330	28 17.07	70 3.27	10.4	223	22.6	77.0	0.152E-01	22.4	1008.9	29	3	180	5	35	24	19.3
2/20	1400	28 14.33	70 2.68	9.3	224	22.8	76.3	0.152E-01	22.6	1009.2	17	3	225	2	0	20	19.4
2/20	1430	28 13.85	70 3.75	9.4	228	23.1	74.6	0.151E-01	22.7	1008.9			0	0	0	0	0.0
2/20	1500	28 12.85	70 4.97	9.5	232	23.3	72.9	0.149E-01	22.8	1008.6	12	5	190	8	30	25	19.4
2/20	1530	28 8.83	70 3.21	12.0	248	23.2	72.0	0.147E-01	23.2	1008.2	7	5	160	13	60	27	19.2
2/20	1600	28 3.26	69 59.47	12.0	248	23.3	72.1	0.148E-01	23.5	1007.9	7	6	160	13	60	27	19.3
2/20	1630	27 57.40	69 55.99	12.0	248	23.2	75.1	0.153E-01	23.5	1007.6	7	5	160	13	60	27	19.6
2/20	1700	27 56.45	69 55.48	11.3	239	23.0	79.7	0.161E-01	23.4	1007.1	72	5	250	1	350	23	20.0
2/20	1730	27 56.38	69 55.43	16.0	239	21.0	82.3	0.148E-01	23.4	1007.0	72	5	250	1	350	32	18.5
2/20	1800	27 55.30	69 55.30	11.9	239	19.8	87.6	0.148E-01	23.1	1007.2	7	6	250	1	350	24	18.0
2/20	1830	27 58.19	69 56.46	15.3	261	20.8	81.3	0.145E-01	23.2	1005.8	74	6	330	12	310	36	18.2
2/20	1900	28 0.79	9 57.74	13.5	246	21.0	90.2	0.163E-01	23.3	1005.3	86	5	330	12	300	30	19.4
2/20	1930	28 5.10	70 0.46	10.6	225	22.8	75.5	0.151E-01	23.0	1005.1	86	5	0	6	240	17	19.3
2/20	2000	28 8.81	69 59.74	8.3	248	23.0	79.7	0.161E-01	23.0	1005.3	86	5	0	6	270	15	20.0
2/20	2030	28 11.78	69 58.69	10.5	253	23.3	72.2	0.148E-01	22.6	1005.3			0	0	0	0	0.0
2/20	2100	28 12.44	70 0.56	12.6	257	23.5	64.7	0.134E-01	22.6	1005.3	1	5	310	8	320	30	18.5
2/20	2130	28 14.77	70 2.09	13.4	264	23.2	72.0	0.147E-01	22.5	1005.8	2	5	340	8	300	29	19.2
2/20	2200	28 14.02	69 58.45	13.5	268	22.5	70.5	0.138E-01	22.0	1006.7	2	6	110	8	130	19	18.4
2/20	2230	28 12.85	69 55.33	10.7	272	22.8	70.0	0.140E-01	21.1	1006.6	26	5	110	3	160	18	18.6
2/20	2300	28 12.09	69 53.33	13.4	279	22.8	65.4	0.131E-01	22.0	1006.5	2	5	280	7	0	33	18.0
2/20	2330	28 13.38	69 52.05	14.1	296	22.0	72.4	0.138E-01	21.5	1007.1	2		90	10	220	19	18.2
2/21	0	28 12.96	69 46.64	12.2	296	22.4	67.3	0.131E-01	22.0	1007.1	1		270	8	20	31	17.9
2/21	30	28 13.02	69 50.43	10.6	297	22.0	70.8	0.135E-01	21.5	1007.3	1		270	8	20	28	18.0
2/21	100	28 12.94	69 54.00	9.0	291	21.6	72.0	0.134E-01	21.4	1007.3	1		270	8	15	25	17.8
2/21	130	28 12.86	69 57.56	9.8	283	21.8	71.4	0.135E-01	22.0	1007.4	1		270	6	10	25	17.9
2/21	200	28 13.19	70 0.05	7.5	290	22.2	69.4	0.134E-01	22.1	1007.7	1		320	7	340	21	18.0
2/21	230	28 14.80	69 58.84	6.7	309	21.5	74.3	0.138E-01	21.4	1008.3	2		310	6	0	19	18.0
2/21	300	28 17.21	69 58.09	9.8	302	21.6	70.4	0.131E-01	20.6	1007.9	1		0	9	320	25	17.6
2/21	330	28 21.29	69 57.70	10.8	303	20.8	72.8	0.130E-01	20.5	1008.1	1		0	9	320	27	17.2
2/21	400	28 25.05	69 57.66	8.8	300	21.0	72.2	0.130E-01	21.6	1008.1	1		0	9	320	23	17.3
2/21	430	28 28.30	69 57.74	9.8	306	20.6	75.6	0.133E-01	21.7	1008.4			0	0	0	0	0.0
2/21	500	28 24.34	69 57.37	10.8	311	20.2	79.0	0.136E-01	21.6	1008.6	1		170	9	120	15	17.4
2/21	530	28 18.60	69 55.88	10.5	315	20.3	78.3	0.136E-01	21.1	1008.2	2		210	9	80	20	17.4
2/21	600	28 15.35	69 58.16	9.3	321	19.5	85.6	0.142E-01	21.2	1008.2	2	2 27 8 3	310	2	10	20	17.5
2/21	630	28 15.24	69 58.62	9.8	320	20.8	77.8	0.139E-01	21.3	1008.5	2	2 27 8 3	310	1	10	20	17.8
2/21	700	28 16.67	69 58.31	11.7	317	20.8	79.5	0.142E-01	21.2	1008.5	2	2 27 8 3	180	4	130	20	18.0
2/21	730	28 13.67	69 57.94	12.4	327	20.7	84.6	0.150E-01	21.1	1009.1	2	2 27 8 3	180	5	140	20	18.5
2/21	800	28 12.68	69 57.94	12.2	346	20.8	83.8	0.150E-01	22.2	1009.1	2		280	3	60	25	18.5
2/21	830	28 12.58	69 57.29	13.6	359	20.7	82.9	0.147E-01	22.3	1009.5	1		90	10	290	28	18.3
2/21	900	28 12.22	69 54.20	14.0	348	20.5	81.9	0.144E-01	22.0	1009.6	1		90	10	280	27	18.0
2/21	930	28 9.37	69 45.64	11.4	345	20.6	81.1	0.143E-01	22.7	1010.1	1		150	11	210	12	18.0
2/21	1000	28 7.42	69 43.73	7.9	325	20.7	84.6	0.150E-01	23.0	1010.2	1		110	11	280	9	18.5
2/21	1030	28 8.35	69 38.38	9.9	354	21.0	76.3	0.138E-01	23.0	1010.5	1		340	9	10	28	17.8
2/21	1100	28 13.25	69 39.05	10.2	9	20.6	83.7	0.148E-01	22.0	1010.7	4	5	340	10	20	29	18.3
2/21	1130	28 17.82	69 40.72	11.9	18	21.4	77.5	0.143E-01	21.0	1011.1	2	5	335	11	30	32	18.3
2/21	1200	28 22.45	69 43.58	10.2	359	21.4	79.1	0.146E-01	21.1	1013.0	2	5	330	10	20	29	18.5
2/21	1230	28 27.08	69 45.84	9.4	345	21.6	76.0	0.142E-01	21.1	1012.7	2	5	330	10	10	28	18.3
2/21	1300	28 31.69	69 48.39	8.9	8	21.6	74.3	0.139E-01	21.6	1013.1	2	5	335	12	20	28	18.1
2/21	1330	28 36.84	69 50.93	9.3	12	21.5	74.2	0.138E-01	21.9	1013.5	2	5	340	11	20	28	18.0
2/21	1400	28 41.97	69 53.14	10.4	25	21.3	77.4	0.142E-01	21.7	1014.0	2	5	340	11	30	29	18.2
2/21	1430	28 47.20	69 55.25	11.8	19	21.0	79.6	0.144E-01	21.9	1014.3	2	5	350	11	20	33	18.2
2/21	1500	28 51.73	69 55.67	11.3	19	19.9	81.3	0.138E-01	22.1	1014.7	1	7	20	3	0	25	17.4
2/21	1530	28 53.32	69 55.79	8.9	41	20.6	76.0	0.134E-01	21.2	1214.7			0	0	0	0	0.0
2/21	1600	28 53.96	69 55.94	6.4	63	21.2	70.7	0.129E-01	21.2	1014.7	2	6	10	10	30	20	17.3
2/21	1630	28 54.72	69 56.05	9.8	31	21.7	74.4	0.140E-01	21.2	1014.8	2	5	10	1	20	20	18.2
2/21	1700	28 55.46	69 56.18	7.8	31	20.7	71.8	0.127E-01	21.2	1014.3	1	5	10	1	20	16	17.0
2/21	1730	28 56.31	69 56.27	8.3	31	20.8	69.4	0.124E-01	21.3	1013.8	1	5	10	1	20	17	16.8
2/21	1800	28 57.17	69 56.38	8.4	52	21.1	69.0	0.125E-01	21.5	1013.5	1	5	10	1	40	17	17.0
2/21	1830	28 58.08	69 56.58	6.8	52	21.1	69.0	0.125E-01	21.4	1013.5	1	5	10	1	40	14	17.0

Table Vb-3 (Cont)

DATE	TIME	LAT		LONG		WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES				SC	SS	AD	AS	TW
2/21	1900	28	58.97	69	56.20	7.8	51	20.7	70.2	0.124E-01	21.7	1013.4	1	5				20	1	30	16	16.8
2/21	1930	28	59.87	69	36.86	6.8	62	21.0	71.3	0.129E-01	21.7	1012.9	1	4				20	1	40	14	17.2
2/21	2000	28	55.51	69	56.15	9.1	64	21.5	72.6	0.135E-01	21.3	1012.9	1	4				170	11	290	18	17.8
2/21	2030	28	50.63	69	55.23	8.2	59	20.8	75.2	0.134E-01	21.2	1013.4	1	3				170	11	290	16	17.5
2/21	2100	28	45.48	69	54.05	7.9	57	21.0	69.7	0.126E-01	21.1	1013.4	1	3				170	11	290	15	17.0
2/21	2130	28	40.51	69	52.86	7.3	67	21.2	69.9	0.127E-01	21.8	1013.8	1	3	30	6	6	170	11	300	16	17.2
2/21	2200	28	35.58	69	57.51	7.6	42	21.4	69.3	0.128E-01	21.9	1014.5	1	2	02		4	170	11	280	12	17.3
2/21	2230	28	30.11	69	50.62	6.6	61	21.2	70.7	0.129E-01	21.8	1014.4	2	2	02	10	4	170	11	300	14	17.3
2/21	2300	28	24.90	69	49.88	5.4	45	21.0	71.3	0.129E-01	21.3	1015.0	2	1	02	10	4	170	11	300	10	17.2
2/21	2330	28	19.32	69	48.93	5.4	45	21.2	68.2	0.124E-01	21.4	1015.5	1					170	11	300	10	17.0
2/22	0	28	13.11	69	48.17	4.4	34	21.1	68.9	0.125E-01	21.2	1015.7	1					170	6	270	6	17.0
2/22	30	28	12.25	69	48.15	5.4	49	21.1	71.4	0.129E-01	22.5	1015.9						200	6	240	6	17.3
2/22	100	28	9.59	69	48.53	6.1	47	21.0	71.3	0.129E-01	22.9	1016.2	1					200	6	230	7	17.2
2/22	130	28	8.92	69	50.14	3.7	66	21.0	72.1	0.130E-01	23.0	1016.3	1					320	6	60	8	17.3
2/22	200	28	11.01	69	51.44	5.9	49	21.1	73.0	0.132E-01	22.8	1016.5						270	6	110	8	17.5
2/22	230	28	11.09	69	53.96	3.1	80	20.9	70.3	0.126E-01	22.7	1016.4						300	6	70	4	17.0
2/22	300	28	13.15	69	54.38	5.1	49	20.8	67.0	0.119E-01	22.7	1016.0						50	8	0	18	16.5
2/22	330	28	16.05	69	50.19	4.1	49	20.7	71.8	0.127E-01	21.2	1016.4						50	11	0	19	17.0
2/22	400	28	19.38	69	45.68	5.3	56	20.8	73.5	0.131E-01	21.1	1015.9						140	11	320	16	17.3
2/22	430	28	15.93	69	41.42	4.6	58	20.8	71.9	0.128E-01	21.1	1015.7						150	11	320	14	17.1
2/22	500	28	11.44	69	37.57	4.0	54	21.0	73.7	0.133E-01	22.5	1015.5	1					150	10	320	12	17.5
2/22	530	28	6.96	69	33.55	3.1	63	21.0	69.6	0.126E-01	23.0	1015.2	1					150	10	330	12	17.0
2/22	600	28	0.16	69	28.50	2.6	59	21.5	67.0	0.124E-01	23.2	1015.2	1					60	10	0	15	17.1
2/22	630	28	12.78	69	23.79	2.8	78	20.6	75.0	0.132E-01	23.2	1015.2	1					50	10	10	15	17.3
2/22	700	28	16.54	69	18.95	2.3	82	20.5	75.8	0.133E-01	23.1	1014.8	1					50	10	10	14	17.3
2/22	730	28	20.70	69	18.03	5.1	85	20.8	71.9	0.128E-01	22.9	1015.5	1					310	11	60	8	17.1
2/22	800	28	24.86	69	21.60	2.3	38	20.6	72.5	0.128E-01	21.1	1015.5	1					180	11	340	8	17.0
2/22	830	28	20.05	69	21.54	1.8	23	21.0	68.0	0.123E-01	22.5	1015.5	1					180	11	350	8	16.8
2/22	900	28	15.29	69	20.92	1.1	96	21.2	69.0	0.126E-01	23.0	1015.2	1					220	11	350	10	17.1
2/22	930	28	15.95	69	19.82	2.3	341	21.4	67.6	0.125E-01	23.1	1015.2	1					40	8	340	11	17.1
2/22	1000	28	20.25	69	15.51	4.3	17	20.8	71.9	0.128E-01	23.0	1015.5	1					40	10	350	18	17.1
2/22	1030	28	24.32	69	11.05	5.7	3	20.8	71.9	0.128E-01	23.0	1015.5	1	2			3	40	9	340	19	17.1
2/22	1100	28	27.52	69	9.33	6.6	141	20.4	74.8	0.130E-01	22.6	1016.0	1	2	04		5	270	11	300	14	17.1
2/22	1130	28	27.86	69	14.09	3.0	10	20.4	73.2	0.128E-01	21.7	1016.2	1	2	04	9	5	270	8	40	9	16.9
2/22	1200	28	28.26	69	18.95	2.1	14	20.5	71.6	0.126E-01	21.3	1016.6	1	2	04	9	6	270	8	30	8	16.8
2/22	1230	28	26.93	69	21.59	1.9	352	20.5	69.1	0.121E-01	21.2	1017.0	1	2	04	9	5	200	8	20	5	16.5
2/22	1300	28	22.74	69	24.05	3.4	12	20.7	71.8	0.127E-01	21.2	1017.1		1	04	9	5	220	11	30	6	17.0
2/22	1330	28	20.77	69	29.16	2.8	5	20.0	77.0	0.131E-01	21.3	1017.3		1	04	9	5	250	11	30	10	17.0
2/22	1400	28	18.79	69	33.92	3.7	335	20.5	75.8	0.133E-01	21.3	1017.4		1	04	9	5	150	11	350	4	17.3
2/22	1430	28	14.09	69	30.59	5.4	25	20.7	74.3	0.132E-01	21.3	1017.7		1	04	9	5	150	11	300	10	17.3
2/22	1500	28	11.12	69	30.80	3.7	15	20.7	73.4	0.130E-01	22.8	1017.6		1	04	9	5	250	11	40	9	17.2
2/22	1530	28	9.70	69	35.55	3.7	31	20.8	71.9	0.128E-01	22.9	1017.7			04	9	5	250	11	40	7	17.1
2/22	1600	28	8.50	69	39.43	3.2	347	21.0	70.4	0.127E-01	23.0	1017.6			04	9	4	250	6	50	8	17.1
2/22	1630	28	8.03	69	41.91	3.7	46	21.5	70.1	0.130E-01	23.2	1017.4			04	9	4	270	6	80	5	17.5
2/22	1700	28	8.26	69	43.96	1.0	119	21.2	68.2	0.124E-01	23.2	1016.7			04	9	4	300	6	0	4	17.0
2/22	1730	28	10.18	69	46.03	1.0	119	21.0	69.6	0.126E-01	23.2	1016.2			04	9	3	300	6	0	4	17.0
2/22	1800	28	10.36	69	48.10	1.4	143	21.2	69.8	0.127E-01	23.3	1015.7			04	9	3	0	11	10	9	17.2
2/22	1830	28	13.85	69	47.72	1.0	94	21.0	69.6	0.126E-01	22.1	1015.7			04	9	3	0	11	10	11	17.0
2/22	1900	28	15.96	69	47.65	1.9	131	21.1	68.9	0.125E-01	21.9	1015.7			04	9	3	90	11	10	14	17.0
2/22	1930	28	15.63	69	42.13	1.0	99	21.1	67.3	0.122E-01	22.1	1015.7			04	9	3	100	3	0	5	16.8
2/22	2000	28	11.76	69	41.70	1.5	120	21.5	66.2	0.123E-01	23.4	1015.7	2		04	8	3	210	1	290	3	17.0
2/22	2030	28	11.71	69	44.65	2.3	128	22.5	63.4	0.124E-01	23.4	1015.7	2		04	8	3	270	11	340	8	17.5
2/22	2100	28	11.87	69	45.37	2.1	113	22.3	65.0	0.125E-01	23.1	1015.7	2		04	8	3	100	0	0	0	0.0
2/22	2130	28	11.84	69	44.52	1.9	99	22.0	66.5	0.127E-01	23.3	1015.7	1		04	8	3	340	0	0	0	0.0
2/22	2200	28	11.82	69	43.86	1.7	84	21.8	68.1	0.128E-01	23.2	1015.7	1		04	8	2	0	0	0	3	17.5
2/22	2230	28	11.67	69	44.31	1.5	69	21.4	68.4	0.126E-01	23.0	1015.9	1		04	8	2	250	3	0	0	17.2
2/22	2300	28	11.70	69	44.78	2.1	99	21.3	69.9	0.128E-01	23.0	1016.0	1		04	8	2	140	0	320	4	17.3
2/22	2330	28	11.86	69	42.15	0.9	159	21.5	64.9	0.124E-01	23.0	1016.0	1		04	8	2	60	5	20	5	17.1
2/23	0	28	13.85	69	37.30	2.1	89	20.9	74.5	0.134E-01	21.7	1015.9	1					320	11	20	9	17.5
2/23	30	28	16.48	69	42.00	4.0	104	20.8	78.6	0.140E-01	21.5	1016.2	1					270	11	330	4	17.9
2/23	100	28	15.84	69	47.57	2.1	179	20.8	78.6	0.140E-01	21.5	1016.2	1					180	11	0	15	17.9
2/23	130	28	12.54	69	44.20	2.2	144	21.3	67.5	0.124E-01	22.9	1016.6	1					120	6	10	10	17.0
2/23	200	28	10.87	69	40.33	2.6	129	21.3	73.2	0.134E-01	23.1	1016.6	1					120	6	0	11	17.7
2/23	230	28	8.89	69	36.70	3.9	148	21.3	70.7	0.130E-01	23.1	1016.7	1					280	7	290	6	17.4
2/23	300	28	8.54	69	39.35	4.3	134	21.8	68.1	0.128E-01	23.1	1016.7	1					270	7	28(	6	17.5
2/23	330	28	8.59	69	42.21	4.4	144	21.6	70.2	0.131E-01	23.4	1016.5	1					0	7	90	5	17.6
2/23	400	28	8.83	69	43.34	4.1	140	20.4	76.5	0.133E-01	23.3	1016.7	1					220	3	300	9	17.3
2/23	430	28	7.77	69	43.62	2.1	189	21.4	69.2	0.128E-01	23.3	1016.5	1					190	3	0	7	17.3
2/23	500	28	8.13	69	43.89	1.5	180	21.3	71.6	0.131E-01	23.2	1016.2	1					0	6	0	3	17.5
2/23	530	28	9.67	69	44.58	1.0	301	21.5	70.1	0.130E-01	23.0	1016.2	1					80	3	320	2	17.5
2/23	600	28	10.29	69	44.38	2.1	265	21.6	69.8	0.130E-01	23.0	1015.9						0	0	0	0	0.0
2/23	630	28	11.91	69	42.61	3.1	229	21.6	69.4	0.130E-01	22.9	1015.5	1					50	6	60	0	17.5
2/23	700	28	12.92	69	36.61	3.4	248	21.4	70.9	0.131E-01	21.3	1014.8	1					130	10	40	9	17.5
2/23	730	28	10.00	69	37.36	4.4	97	21.5	70.2	0.130E-01	23.0	1014.8	5					180	6	310	11	17.5
2/23	800	28	9.93	69	33.87	3.1	240	21.7	73.6	0.138E-01	23.0	1014.6	5					80	6	80	2	18.1
2/23	830	28	10.68	69	29.75	3.5	244	22.0	72.3	0.138E-01	22.8	1014.6	5					70	6	140	1	18.2
2/23	900	28	11.78	69	24.69	3.1	166	21.6	71.1	0.133E-01	22.6	1014.3	5					80	10	30	12	17.7
2/23	930	28	14.39	69	20.01	4.2	187	21.6	65.5	0.122E-01	21.6	1014.6	5					0	11	340	3	17.0
2/23	1000	28	14.41	69	19.17	2.8	30	21.2	76.4	0.139E-01	22.6	1014.8	5					0	11	10	16	18.0
2/23	1030	28	14.90	69	18.59	2.3	256	21.4	76.6	0.141E-01	22.2	1014.8	5					50	4	270	2	18.2
2/23	1100	28	15.64	69	20.76	0.5	269	21.1	78.9	0.143E-01	21.2	1015.0	5					270	10	0	11	18.2
2/23	1130	28	15.85	69	25.29	3.4	190	21.6	80.1	0.150E-01	21.4	1015.1	5					270	10	330	13	18.8
2/23	1200	28	15.84	69	31.58	5.0	189	21.8	72.1	0.136E-01	21.2	1015.5	5		04	8	1	250	10	330	17	18.0
2/23	1230	28	14.12	69	36.58	6.3	178	21.8	72.1	0.136E-01	21.4	1015.6	5		04	8	1	250	10	320	18	18.0
2/23	1300	28	12.38	69	41.57	7.3	199	22.1	68.4	0.131E-01	21.5	1015.9	5		04	8	1	250	10	330	22	17.8
2/23	1330	28	9.88	69	42.22	5.0	198	22.6	67.4	0.133E-01	22.9	1015.8	5		04	8	1	130	12	30	18	18.1

Table Vb-3 (Cont)

DATE	TIME	LAT		LONG		WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES				SC	SS	AD	AS	TW
2/23	1400	28	5.33	69	33.83	5.9	162	22.5	73.5	0.144E-01	23.4	1015.8	5		04	8	1	140	14	10	25	18.8
2/23	1430	28	3.62	69	34.64	7.0	157	22.5	73.1	0.143E-01	23.6	1015.7						0	0	0	0	0.0
2/23	1500	28	5.74	69	34.19	8.0	152	22.4	72.6	0.142E-01	23.4	1015.6						0	0	0	0	0.0
2/23	1530	28	9.92	69	33.07	9.1	147	22.4	72.2	0.140E-01	23.0	1015.4						0	0	0	0	0.0
2/23	1600	28	10.31	69	33.58	10.1	142	22.3	71.7	0.139E-01	21.8	1015.3	5					210	3	300	21	18.4
2/23	1630	28	9.65	69	34.09	7.3	188	22.9	70.8	0.142E-01	22.9	1014.9	2					270	3	290	15	18.8
2/23	1700	28	10.16	69	34.57	6.9	134	23.0	70.9	0.143E-01	21.6	1015.2	2					0	4	120	11	18.9
2/23	1730	28	10.99	69	34.00	6.2	199	23.0	71.7	0.145E-01	21.6	1014.6	2		06		4	230	0	330	12	19.0
2/23	1800	28	11.16	69	33.90	9.3	209	24.0	65.1	0.139E-01	21.5	1014.3	2		06		3	280	0	290	18	19.0
2/23	1830	28	10.95	69	33.97	8.0	206	23.5	72.1	0.150E-01	21.5	1013.8	2		06		3	270	1	300	16	19.5
2/23	1900	28	10.83	69	33.62	3.1	139	23.2	74.2	0.151E-01	21.5	1013.8	2	2	06		3	140	10	0	16	19.5
2/23	1930	28	10.36	69	32.97	6.6	211	23.1	74.9	0.152E-01	21.6	1013.4	2	2				140	3	60	14	19.5
2/23	2000	28	9.50	69	31.28	8.4	220	23.6	75.4	0.157E-01	22.6	1013.1	2	2				140	3	70	17	20.0
2/23	2030	28	9.51	69	29.80	8.8	239	23.5	76.1	0.158E-01	22.9	1013.4	2	3				120	0	120	17	20.0
2/23	2100	28	10.16	69	29.61	8.3	226	23.7	67.0	0.141E-01	22.1	1013.0	2	3				240	6	350	22	19.0
2/23	2130	28	9.19	69	30.17	9.3	229	23.7	64.8	0.136E-01	22.8	1013.4	2	4				130	0	100	18	18.7
2/23	2200	28	8.93	69	29.93	7.8	228	23.5	69.9	0.145E-01	23.0	1013.4	2	2	20	8	3	240	3	350	18	19.2
2/23	2230	28	8.93	69	30.34	8.9	220	23.3	65.9	0.135E-01	23.0	1013.4	4	2	20	8	3	300	3	290	18	18.5
2/23	2300	28	10.05	69	30.96	7.1	229	22.9	66.9	0.134E-01	21.7	1013.6	4	2	20		3	300	3	300	15	18.3
2/23	2330	28	10.10	69	31.51	8.4	224	22.8	68.4	0.136E-01	21.5	1013.8	1	2			3	250	5	340	21	18.4
2/24	0	28	9.95	69	33.14	7.9	196	22.8	70.7	0.141E-01	21.7	1013.9	1	2			3	90	7	80	15	18.7
2/24	30	28	9.39	69	31.25	7.8	242	22.8	71.5	0.143E-01	21.8	1014.1	1	2			2	140	6	80	15	18.8
2/24	100	28	10.40	69	27.75	5.1	227	22.8	76.2	0.152E-01	22.0	1014.4	1	2			2	40	3	190	7	19.4
2/24	130	28	9.59	69	27.15	7.8	227	23.0	71.7	0.145E-01	22.5	1014.1	1	2			2	240	4	350	19	19.0
2/24	200	28	9.94	69	27.35	7.2	232	22.8	77.0	0.154E-01	22.3	1014.0	5	2			2	300	10	320	20	19.5
2/24	230	28	12.51	69	31.75	5.8	246	22.5	77.6	0.152E-01	21.4	1014.1	2	1			2	230	7	10	18	19.3
2/24	300	28	10.51	69	31.16	6.7	247	22.3	80.7	0.157E-01	21.5	1014.4	5	1			2	100	7	120	8	19.5
2/24	330	28	9.39	69	30.79	6.2	81	22.8	77.8	0.155E-01	21.4	1014.0	5	1			2	140	6	320	16	19.6
2/24	400	28	8.19	69	29.02	8.1	232	22.5	79.2	0.155E-01	21.9	1013.9	5	1			2	40	6	200	10	19.5
2/24	430	28	10.43	69	29.34	5.7	229	22.3	81.5	0.158E-01	21.3	1013.7	5	1			2	230	6	0	17	19.6
2/24	500	28	8.72	69	30.85	5.1	226	22.9	79.5	0.160E-01	21.5	1013.7	5	1			2	90	6	100	7	19.9
2/24	530	28	9.65	69	27.75	7.7	229	22.4	81.6	0.159E-01	21.6	1013.5	1	1			2	310	6	300	17	19.7
2/24	600	28	9.60	69	29.39	7.0	211	22.8	81.1	0.162E-01	21.3	1012.9	1	1			2	240	6	340	19	20.0
2/24	630	28	8.95	69	29.05	6.8	221	22.2	85.7	0.165E-01	21.4	1012.9	1	1			2	90	7	100	10	20.0
2/24	700	28	9.97	69	28.62	5.3	212	22.5	85.9	0.169E-01	21.3	1012.4	1	1			2	260	6	330	15	20.3
2/24	730	28	9.00	69	29.55	4.6	219	22.4	85.0	0.166E-01	21.4	1012.4	5	1			2	90	7	80	7	20.1
2/24	800	28	9.75	69	27.81	5.2	227	22.2	85.7	0.165E-01	21.4	1012.6	5	1			2	290	6	320	14	20.0
2/24	830	28	9.15	69	30.15	4.0	230	22.2	89.1	0.172E-01	21.4	1012.9	5	1			2	90	6	90	5	20.4
2/24	900	28	9.31	69	26.49	8.7	222	22.2	85.7	0.165E-01	21.4	1012.4	5	1			2	300	6	300	19	20.0
2/24	930	28	10.91	69	29.15	5.7	224	22.4	84.1	0.164E-01	21.4	1012.4	2	1			2	240	6	350	17	20.0
2/24	1000	28	9.47	69	28.28	8.1	217	22.8	82.7	0.165E-01	21.3	1013.4	1	1			2	300	7	300	18	20.2
2/24	1030	28	9.72	69	35.52	7.2	202	21.8	88.0	0.166E-01	21.5	1012.2	5	1			2	270	10	320	20	19.9
2/24	1100	28	8.43	69	37.83	7.7	206	22.2	85.7	0.165E-01	22.3	1012.3	5	2			2	240	10	340	24	20.0
2/24	1130	28	6.24	69	42.05	10.1	194	22.3	90.0	0.175E-01	23.1	1013.0	5	2			2	270	6	300	22	20.6
2/24	1200	28	6.26	69	45.44	9.6	205	22.5	85.9	0.169E-01	23.3	1013.1	9	3			2	270	6	310	22	20.3
2/24	1230	28	7.16	69	46.34	7.7	202	22.7	84.3	0.167E-01	23.3	1013.5						0	0	0	0	0.0
2/24	1300	28	11.20	69	45.84	5.7	199	22.8	82.7	0.165E-01	23.4	1014.0	9	2			2	0	9	250	4	20.2
2/24	1330	28	14.60	69	44.15	8.8	221	23.3	84.8	0.174E-01	23.2	1014.2	5	2			2	90	9	100	13	20.9
2/24	1400	28	14.46	69	40.75	8.2	224	22.9	83.6	0.168E-01	23.0	1014.2	2	2			2	90	7	110	12	20.4
2/24	1430	28	14.03	69	36.42	8.5	206	22.8	86.1	0.172E-01	22.5	1014.3	9	2			2	90	10	80	15	20.6
2/24	1500	28	12.36	69	31.53	6.6	206	22.8	84.4	0.168E-01	21.8	1014.4	9	3			3	150	2	50	14	20.4
2/24	1530	28	10.89	69	33.52	8.0	212	23.0	86.2	0.174E-01	22.0	1014.0	9	3				240	6	340	21	20.8
2/24	1600	28	9.91	69	35.10	5.8	203	23.4	78.3	0.162E-01	22.0	1013.8	7	3				320	5	270	10	20.2
2/24	1630	28	11.62	69	36.89	9.5	204	23.5	80.8	0.168E-01	22.5	1013.4	7	3				280	2	290	19	20.6
2/24	1700	28	12.83	69	36.15	8.8	219	23.8	77.9	0.164E-01	22.8	1013.1	7	3				40	5	180	12	20.5
2/24	1730	28	14.38	69	34.90	8.2	189	22.2	87.4	0.169E-01	22.3	1011.9	7	3				200	1	350	17	20.2
2/24	1800	28	14.13	69	35.12	10.3	239	23.2	83.1	0.169E-01	22.3	1011.9	7	3				240	0	0	20	20.6
2/24	1830	28	12.97	69	33.18	7.3	231	23.1	85.5	0.173E-01	21.9	1011.5	2	3				120	10	70	14	20.8
2/24	1900	28	10.62	69	32.18	8.4	223	23.7	82.6	0.173E-01	21.7	1011.0	237	4				240	10	350	26	21.0
2/24	1930	28	8.94	69	36.96	11.6	214	23.2	84.7	0.173E-01	22.1	1010.8	2	4				320	10	280	22	20.8
2/24	2000	28	12.97	69	36.35	9.9	214	23.2	86.4	0.176E-01	22.5	1011.0	7	4				20	10	210	10	21.0
2/24	2030	28	15.76	69	34.61	10.0	219	23.2	87.2	0.178E-01	22.5	1010.5	7	4				160	10	40	26	21.1
2/24	2100	28	11.05	69	32.87	10.7	233	22.8	85.3	0.170E-01	23.0	1010.8	7	3	21	8	4	160	11	50	26	20.5
2/24	2130	28	9.31	69	33.15	12.2	213	22.0	87.3	0.167E-01	21.9	1010.5	7	4				240	8	340	31	20.0
2/24	2200	28	8.15	69	36.27	9.5	207	22.3	80.7	0.157E-01	22.5	1010.8	47	3				350	8	240	13	19.5
2/24	2230	28	11.68	69	36.55	7.6	201	22.5	85.1	0.167E-01	22.6	1010.8	99	4				350	8	240	9	20.2
2/24	2300	28	14.69	69	35.43	7.2	209	22.5	97.2	0.191E-01	22.6	1010.3	9	4				210	3	0	17	21.6
2/24	2330	28	14.12	69	35.26	9.8	199	21.8	89.8	0.169E-01	22.5	1010.2						200	1	0	20	20.1
2/25	0	28	11.74	69	34.46	7.9	217	22.3	89.2	0.173E-01	22.1	1010.1						160	7	40	20	20.5
2/25	30	28	8.60	69	33.17	8.4	222	22.6	87.7	0.173E-01	21.7	1009.5	5					180	7	30	22	20.6
2/25	100	28	4.82	69	33.06	9.9	220	22.6	90.3	0.178E-01	21.8	1009.6	5					180	7	30	25	20.9
2/25	130	28	5.93	69	33.21	9.9	217	22.8	84.5	0.169E-01	21.8	1009.6	5					350	8	250	15	20.4
2/25	200	28	9.40	69	33.37	8.5	212	22.8	85.3	0.170E-01	22.2	1009.2	5					350	8	250	12	20.5
2/25	230	28	12.49	69	33.63	9.4	200	22.8	87.0	0.174E-01	22.1	1009.1	5					350	8	230	12	20.7
2/25	300	28	12.27	69	33.70	11.1	211	23.2	81.5	0.166E-01	22.5	1008.4	5					185	7	20	28	20.4
2/25	330	28	9.08	69	33.58	11.4	198	23.1	84.7	0.172E-01	22.6	1008.0	5					185	7	10	29	20.7
2/25	400	28	5.92	69	33.32	11.2	212	22.3	91.8	0.178E-01	22.6	1008.0	5					185	8	20	29	20.8
2/25	430	28	6.66	69	30.99	13.3	208	22.5	80.1	0.157E-01	21.7	1007.7	5					35	8	170	18	19.6
2/25	500	28	9.55	69	28.70	12.3	205	22.2	86.6	0.167E-01	22.1	1006.7	5					350	8	230	18	20.1
2/25	530	28	10.48	69	26.29	11.4	210	22.5	88.5	0.174E-01	22.2	1006.7	5					110	8	80	22	20.6
2/25	600	28	10.74	69	24.64	10.8	209	22.1	91.8	0.177E-01	22.2	1006.5						0	0	0	0	0.0
2/25	615	28	10.03	69	24.88	10.1	207	21.8	95.1	0.179E-01	22.2	1006.3	5					180	7	20	26	20.7
2/25	630	28	8.36	69	24.84	13.1	219	22.1	93.5	0.179E-01	21.7	1005.8	5					180	8	30	32	20.8
2/25	700	28	6.79	69	22.30	12.1	217	22.5	90.2	0.177E-01	23.1	1005.8	5					270	8	320	29	20.8
2/25	730	28	7.74	69	26.66	7.4	235	21.7	90.6	0.170E-01	21 6	1004.9	5					280	7	330	20	20.1

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES			SC	SS	AD	AS	TW
2/25	800	28 6.30	69 28.99	12.3	209	22.2	87.5	0.169E-01	21.5	1005.3	5				70	9	120	18	20.2
2/25	830	28 7.72	69 24.60	10.9	229	22.7	90.4	0.179E-01	22.2	1005.3	5				120	7	90	20	21.0
2/25	900	28 6.97	69 22.95	11.6	245	22.8	85.3	0.170E-01	22.9	1004.9	5				220	6	20	28	20.5
2/25	930	28 6.62	69 26.28	13.9	220	22.5	86.8	0.170E-01	22.0	1004.4	5				270	7	320	32	20.4
2/25	1000	28 7.17	69 27.61	10.8	214	22.7	87.0	0.173E-01	21.5	1004.5					65	9	130	14	20.6
2/25	1030	28 7.93	69 24.31	5.7	273	21.2	95.7	0.175E-01	22.5	1004.2					120	9	100	5	20.2
2/25	1100	28 7.05	69 25.18	11.1	213	22.6	89.5	0.177E-01	22.8	1003.7	7	3			240	7	340	28	20.8
2/25	1130	28 6.26	69 26.05	10.0	243	19.8	88.6	0.149E-01	22.1	1004.1	9	4			270	6	340	25	18.1
2/25	1200	28 5.06	69 29.11	10.9	254	21.1	91.2	0.165E-01	21.4	1003.6	9	4			215	7	30	27	19.6
2/25	1230	28 5.50	69 25.30	13.2	231	21.3	91.3	0.167E-01	22.2	1003.8	9	3			65	9	160	17	19.8
2/25	1300	28 8.02	69 24.14	13.7	235	20.4	89.8	0.157E-01	22.0	1003.6	5	5			270	4	330	30	18.8
2/25	1330	28 8.26	69 26.00	12.0	221	21.4	90.5	0.167E-01	22.4	1003.3	5	5			290	4	300	25	19.8
2/25	1400	28 9.06	69 27.37	12.8	237	21.5	87.0	0.161E-01	22.5	1003.5	5	5			110	8	110	21	19.5
2/25	1430	28 6.49	69 24.32	9.8	241	22.0	82.2	0.157E-01	22.3	1003.4	5	5			140	7	80	19	19.4
2/25	1500	28 4.49	69 24.45	8.0	241	22.1	86.6	0.166E-01	22.5	1003.2	5	5			270	7	340	22	20.0
2/25	1530	28 3.52	69 28.04	8.9	228	22.7	81.1	0.161E-01	22.0	1002.9	5	6			270	7	330	23	19.9
2/25	1600	28 3.35	69 22.30	11.8	269	22.2	85.8	0.165E-01	22.2	1003.0	5	5			90	8	180	15	20.0
2/25	1630	28 3.39	69 24.34	9.2	271	22.6	79.4	0.157E-01	22.8	1002.3	53	4			0	6	290	19	19.6
2/25	1700	28 4.24	69 24.35	10.3	269	22.9	72.5	0.145E-01	22.7	1003.4	53	4			160	0	110	20	19.0
2/25	1730	28 4.26	69 30.41	9.9	255	23.1	63.6	0.129E-01	22.4	1002.5	13	4			270	8	350	27	18.0
2/25	1800	28 3.03	69 30.37	8.8	241	23.5	68.5	0.142E-01	22.4	1002.0	13	5			220	1	20	18	19.0
2/25	1830	28 3.56	69 29.52	11.2	256	22.9	72.5	0.145E-01	22.4	1001.6	13	5			50	8	220	15	19.0
2/25	1900	28 5.12	69 26.66	10.7	257	22.8	69.3	0.138E-01	22.4	1001.6	23	5			50	7	220	15	18.5
2/25	1930	28 7.05	69 25.08	11.5	252	23.2	70.5	0.144E-01	22.5	1001.6	23	5			220	2	30	24	19.0
2/25	2000	28 7.04	69 25.82	12.5	250	22.9	72.5	0.145E-01	22.4	1001.1	23	5			350	4	270	24	19.0
2/25	2030	28 8.02	69 26.50	12.5	230	22.8	74.8	0.149E-01	22.5	1000.9	23	5			340	8	270	23	19.2
2/25	2100	28 11.99	69 26.46	9.9	265	20.2	84.4	0.145E-01	22.6	1001.1	33	5			10	8	280	19	18.0
2/25	2130	28 15.56	69 26.11	12.1	261	21.0	81.5	0.147E-01	22.7	1001.1	53	5			350	8	290	25	18.4
2/25	2200	28 19.04	69 25.82	15.6	292	20.5	80.2	0.141E-01	22.5	1001.7	58	6			135	8	150	23	17.8
2/25	2230	28 16.57	69 22.33	11.7	291	20.7	79.5	0.141E-01	22.7	1001.9	5	6			125	8	160	15	17.9
2/25	2300	28 13.81	69 18.84	12.5	289	20.6	72.7	0.128E-01	22.7	1002.3	5	6			130	8	150	17	17.0
2/25	2330	28 10.92	69 15.35	10.9	33	20.6	72.7	0.128E-01	22.7	1002.7					135	8	280	21	17.0
2/26	0	28 7.99	69 12.64	8.8	16	20.5	70.1	0.123E-01	23.3	1002.8					135	8	270	15	16.6
2/26	30	28 5.24	69 9.14	11.3	286	20.5	70.1	0.123E-01	23.4	1002.7	1				140	8	130	16	16.6
2/26	100	28 2.26	69 5.95	10.3	281	20.7	71.1	0.126E-01	23.4	1003.0	5				45	8	260	17	16.9
2/26	130	28 3.38	69 1.91	10.8	297	20.4	85.4	0.149E-01	23.4	1003.2					60	8	260	18	18.3
2/26	200	28 6.43	68 59.13	8.9	277	20.7	67.9	0.120E-01	23.5	1003.4					45	8	260	14	16.5
2/26	230	28 9.33	68 55.65	10.4	297	20.1	76.4	0.131E-01	23.5	1003.4					40	8	280	20	17.0
2/26	300	28 12.58	68 52.44	8.3	275	20.7	69.5	0.123E-01	23.4	1003.1					35	8	270	14	16.7
2/26	330	28 15.58	68 48.96	11.6	279	20.7	67.9	0.120E-01	23.3	1002.9					30	8	270	21	16.5
2/26	400	28 19.01	68 46.01	12.1	260	20.2	68.2	0.117E-01	23.1	1002.4					300	8	330	30	16.1
2/26	430	28 21.67	68 48.19	12.6	264	20.4	65.2	0.114E-01	22.7	1001.9					290	7	340	31	15.9
2/26	500	28 23.83	68 51.16	12.7	273	19.5	73.3	0.121E-01	21.3	1002.0					300	8	340	32	16.1
2/26	530	28 26.11	68 54.01	13.1	270	19.0	74.6	0.120E-01	21.1	1002.0					310	8	330	32	15.8
2/26	600	28 28.53	68 56.78	12.7	282	18.5	76.3	0.119E-01	21.4	1001.8					0	0	0	0	0.0
2/26	630	28 30.85	68 59.91	12.2	293	17.9	78.0	0.118E-01	21.8	1001.6					320	8	340	31	15.2
2/26	700	28 33.34	69 2.46	13.7	284	17.4	75.8	0.111E-01	22.0	1001.6					310	8	340	34	14.5
2/26	730	28 34.17	69 5.61	15.5	293	17.0	81.0	0.116E-01	22.0	1002.0		6			230	9	50	35	14.7
2/26	800	28 31.44	69 8.66	17.9	311	16.5	96.5	0.134E-01	21.7	1002.5		7			240	8	60	38	15.8
2/26	830	28 28.17	69 14.01	14.5	312	16.6	0.0	0.000E+00	21.9	1003.0		7			240	7	60	31	0.0
2/26	900	28 27.08	69 15.43	13.9	314	16.7	84.6	0.119E-01	22.0	1003.4		7			240	8	60	30	14.8
2/26	930	28 23.01	69 17.77	15.1	294	17.4	75.7	0.111E-01	21.8	1004.4	5	7			210	8	70	31	14.5
2/26	1000	28 21.46	69 20.69	15.9	308	17.2	82.1	0.119E-01	22.0	1005.1		6			235	8	60	34	15.0
2/26	1030	28 17.71	69 23.33	12.8	308	17.7	67.1	0.100E-01	22.2	1005.1	5	6			135	8	170	17	13.8
2/26	1100	28 16.40	69 21.89	17.0	314	18.1	60.7	0.926E-02	22.2	1006.1	7	6			135	8	180	25	13.4
2/26	1130	28 13.52	69 18.45	12.3	303	17.5	69.5	0.102E-01	22.5	1006.9	2	6			130	8	170	16	13.9
2/26	1200	28 11.07	69 16.07	11.3	309	17.5	66.8	0.985E-02	22.2	1006.7	2	6			130	8	180	14	13.6
2/26	1230	28 5.97	69 10.15	11.4	24	17.7	74.2	0.111E-01	23.2	1007.2	2	7			125	8	280	22	14.6
2/26	1300	28 5.03	69 10.90	17.8	316	17.6	78.6	0.117E-01	23.2	1007.9	8	8			225	7	80	35	15.0
2/26	1330	28 2.63	69 13.27	19.1	289	17.9	67.2	0.102E-01	23.1	1008.4	5	8			220	7	60	40	14.0
2/26	1400	28 0.25	69 15.72	17.5	279	18.9	60.8	0.973E-02	23.0	1008.6	1	9			220	7	50	38	14.1
2/26	1430	27 57.95	69 18.33	14.6	308	18.3	71.2	0.110E-01	23.3	1009.2	5	10			225	7	70	30	14.8
2/26	1500	27 55.45	69 21.26	17.7	293	18.1	70.1	0.107E-01	23.0	1009.4	1	12			225	6	60	37	14.5
2/26	1530	27 54.88	69 24.04	13.8	300	18.2	65.0	0.998E-02	23.2	1010.0	1	12			265	5	30	31	14.0
2/26	1600	27 54.98	69 26.96	19.2	292	17.9	59.5	0.898E-02	22.7	1010.2	1	12			225	6	60	40	13.1
2/26	1630	27 52.63	69 28.12	15.9	329	18.0	53.8	0.817E-02	22.2	1010.5	1	12			190	7	130	26	12.5
2/26	1700	27 49.76	69 28.14	13.5	295	18.4	56.0	0.870E-02	22.6	1010.5	1	12			180	7	100	24	13.1
2/26	1730	27 44.90	69 29.37	12.0	306	18.6	57.9	0.911E-02	22.9	1010.5	1	12			180	7	110	20	13.5
2/26	1800	27 43.32	69 28.41	11.5	311	18.6	58.3	0.914E-02	23.2	1010.8					0	0	0	0	0.0
2/26	1830	27 40.02	69 29.26	11.0	316	18.5	58.6	0.916E-02	23.4	1011.1	1	5	31	14	180	7	120	17	13.5
2/26	1900	27 34.96	69 28.41	11.5	315	18.6	56.3	0.885E-02	23.3	1011.0	1	5	31	14	180	7	120	18	13.3
2/26	1930	27 33.27	69 28.52	14.5	312	18.6	57.9	0.910E-02	23.3	1011.0	1	5	31	11	180	7	120	24	13.5
2/26	2000	27 29.97	69 28.70	11.5	315	18.9	53.5	0.856E-02	23.4	1011.0	1	5	31	10	180	7	120	18	13.2
2/26	2030	27 26.75	69 28.76	10.5	308	19.2	62.0	0.101E-01	23.5	1011.0	2	4	31	8	180	7	110	17	14.5
2/26	2100	27 21.62	69 29.02	9.1	313	19.0	56.8	0.914E-02	23.5	1011.8	2	4	30	6	190	7	100	15	13.7
2/26	2130	27 20.00	69 29.13	8.6	303	19.7	50.7	0.850E-02	22.9	1011.9	2	2	30	6	170	7	110	13	13.5
2/26	2200	27 16.50	69 28.99	9.4	329	19.5	52.6	0.871E-02	23.3	1012.2	2	2	30	4	180	8	130	12	0.0
2/26	2230	27 13.27	69 29.01	10.0	313	19.3	54.5	0.891E-02	22.8	1012.6	5	2		8	175	7	120	15	0.0
2/26	2300	27 9.92	69 28.78	6.7	327	19.1	56.4	0.912E-02	22.9	1012.6	5	2		8	180	7	120	8	0.0
2/26	2330	27 6.32	69 28.80	8.8	303	18.9	58.3	0.932E-02	23.4	1013.7	5				185	8	90	15	13.8
2/27	0	27 2.13	69 29.07	6.3	324	19.3	61.2	0.100E-01	23.5	1013.6					185	8	100	8	14.5
2/27	30	26 58.11	69 29.12	6.6	308	19.2	57.0	0.928E-02	23.7	1013.9					180	8	90	10	13.9
2/27	100	26 54.02	69 29.44	6.1	289	19.7	53.0	0.888E-02	23.7	1014.1					180	8	70	12	13.8
2/27	130	26 50.13	69 29.51	4.4	294	19.2	46.8	0.763E-02	23.7	1014.3					180	8	60	9	12.6
2/27	200	26 46.11	69 29.72	2.9	299	19.3	49.3	0.807E-02	23.7	1014.6	1	1	28	4	175	7	50	6	13.0
2/27	230	26 42.17	69 29.63	2.1	313	19.3	47.8	0.782E-02	23.6	1014.6	1	1	28	4	180	8	30	6	12.8

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES				SC	SS	AD	AS	TV
2/27	300	26 38.34	69 29.65	3.0	280	19.2	46.1	0.750E-02	23.5	1014.7	1	1	28		3	180	8	40	9	12.5
2/27	330	26 34.48	69 30.00	3.1	269	19.2	46.1	0.750E-02	24.0	1014.7	5		28		3	270	7	0	13	12.5
2/27	400	26 33.45	69 33.71	1.5	269	19.3	53.2	0.871E-02	24.1	1014.6	5		28		3	270	7	0	10	13.5
2/27	430	26 34.23	69 37.47	1.5	279	19.8	51.6	0.869E-02	24.3	1014.8	5		28		3	280	8	0	11	13.7
2/27	500	26 34.73	69 41.60	1.4	169	19.8	50.1	0.843E-02	24.1	1014.8	5					270	8	340	8	13.5
2/27	530	26 34.89	69 45.65	2.8	159	20.0	51.1	0.871E-02	24.2	1014.3	5					270	8	320	8	13.8
2/27	600	26 34.86	69 49.50	2.9	185	20.0	51.1	0.872E-02	24.3	1013.4	5					260	8	330	11	13.8
2/27	630	26 35.08	69 54.27	3.2	213	20.2	53.0	0.913E-02	24.3	1013.4	5					260	8	340	13	14.2
2/27	700	26 34.70	69 57.76	2.3	201	20.3	54.6	0.947E-02	24.2	1013.4	5					260	8	340	11	14.5
2/27	730	26 34.61	70 1.76	2.7	208	20.2	55.3	0.953E-02	24.0	1012.9	5					260	8	340	12	14.5
2/27	800	26 34.52	70 6.08	2.3	201	20.4	51.0	0.889E-02	22.8	1012.9	5					260	8	340	11	14.1
2/27	830	26 35.29	70 9.62	4.6	206	20.0	58.9	0.100E-01	24.0	1012.9	5					0	8	270	4	14.8
2/27	900	26 39.35	70 8.88	2.1	236	20.0	52.7	0.898E-02	24.0	1013.2	5					10	8	330	6	14.0
2/27	930	26 45.09	70 8.46	4.4	200	20.0	56.5	0.964E-02	24.0	1013.1	5	1	32	9	3	0	8	270	3	14.5
2/27	1000	26 47.19	70 8.57	5.8	242	19.9	54.8	0.929E-02	24.0	1013.3	5	1	32	9	3	355	8	290	11	14.2
2/27	1030	26 51.22	70 8.73	8.0	229	19.8	53.9	0.909E-02	24.0	1013.0	5	1	32	9	3	0	8	260	12	14.0
2/27	1100	26 55.36	70 8.68	6.7	207	19.9	54.1	0.916E-02	23.8	1013.2	1	1	32	9	3	0	8	240	7	14.1
2/27	1130	26 59.47	70 8.58	7.6	215	20.0	60.5	0.103E-01	23.8	1013.1	1	1	32	9	3	0	7	240	10	15.0
2/27	1200	27 3.36	70 8.97	6.5	191	20.2	55.2	0.952E-02	23.7	1013.8	1	1	33	9	5	0	8	210	5	14.5
2/27	1230	27 7.78	70 8.38	8.4	207	20.4	57.8	0.101E-01	23.5	1014.0	1	1	33	9	5	0	8	230	10	15.0
2/27	1300	27 11.68	70 7.98	6.3	205	20.4	54.0	0.941E-02	23.7	1014.3	1	1	33	9	5	0	8	240	6	14.5
2/27	1330	27 15.66	70 8.00	7.2	179	20.3	55.4	0.960E-02	23.5	1014.4	1	1	33	9	4	0	8	180	6	14.6
2/27	1400	27 19.62	70 7.90	7.3	198	20.7	57.5	0.102E-01	23.4	1014.1	4	1	33	9	4	0	8	220	7	15.2
2/27	1430	27 23.59	70 7.88	6.1	198	20.9	63.9	0.115E-01	23.3	1014.1	4	1	35	9	4	0	8	230	5	16.2
2/27	1500	27 27.47	70 7.86	8.0	184	20.9	60.0	0.108E-01	23.4	1014.3	5	2	35	9	4	350	8	210	8	15.7
2/27	1530	27 31.46	70 8.04	7.3	193	21.0	58.2	0.105E-01	23.5	1014.0						0	0	0	0	0.0
2/27	1600	27 35.31	70 8.29	6.5	201	21.0	56.3	0.102E-01	23.3	1013.8	5	2	35		4	0	8	230	6	15.3
2/27	1630	27 39.34	70 8.38	7.2	194	21.0	61.7	0.111E-01	23.4	1013.9	5	2	35		4	10	8	190	6	16.0
2/27	1700	27 43.33	70 7.80	9.2	213	21.2	61.9	0.113E-01	23.1	1013.8	2	2	35		4	10	8	220	11	16.2
2/27	1730	27 47.35	70 7.84	9.9	227	21.2	55.1	0.101E-01	23.0	1013.4	2	3	33		4	0	8	250	15	15.3
2/27	1800	27 51.36	70 7.82	11.9	222	21.2	63.5	0.116E-01	23.0	1012.9	2	3	33		4	0	8	240	18	16.4
2/27	1830	27 55.35	70 7.90	12.2	193	21.2	62.8	0.114E-01	23.0	1011.9	2	4	30		4	0	8	200	16	16.3
2/27	1900	27 59.29	70 7.87	8.5	215	21.8	62.7	0.118E-01	23.0	1011.9	2	4	30		4	0	8	240	11	16.8
2/27	1930	28 3.29	70 7.75	9.9	218	21.8	60.4	0.114E-01	23.1	1011.5	2	4	30		4	0	8	240	14	16.5
2/27	2000	28 7.26	70 7.75	10.7	205	22.0	59.2	0.113E-01	23.0	1011.0	2	4	30		4	0	8	220	14	16.5
2/27	2030	28 11.30	70 7.77	10.7	195	22.0	61.4	0.117E-01	23.0	1011.0	2	3	30		4	350	8	220	14	16.8
2/27	2100	28 15.33	70 7.83	11.2	196	21.4	63.8	0.118E-01	23.0	1011.2	1	4	30		2	350	8	220	15	16.6
2/27	2130	28 19.37	70 7.94	10.4	209	21.8	65.0	0.123E-01	23.3	1011.0	1	4				350	8	240	15	17.1
2/27	2200	28 23.36	70 7.80	12.7	197	21.8	64.2	0.121E-01	22.9	1011.0	1	4				350	8	220	18	17.0
2/27	2230	28 27.28	70 7.88	11.3	203	21.8	68.9	0.130E-01	22.8	1010.8	1	4				350	8	230	16	17.6
2/27	2300	28 31.32	70 7.87	9.0	206	21.6	65.6	0.122E-01	22.6	1010.9	1	4				350	8	240	12	17.0
2/27	2330	28 35.42	70 8.10	10.9	210	21.5	65.5	0.121E-01	22.5	1011.0						350	8	240	16	16.9
2/28	0	28 39.10	70 8.35	9.9	208	21.7	63.4	0.119E-01	22.6	1010.9						350	8	240	14	16.8
2/28	30	28 43.45	70 8.42	9.0	219	21.5	67.0	0.124E-01	22.9	1011.2						355	8	250	13	17.1
2/28	100	28 47.74	70 8.58	8.4	221	21.7	64.1	0.120E-01	22.9	1011.1						350	8	260	13	16.9
2/28	130	28 49.02	70 4.70	10.7	223	21.7	66.5	0.125E-01	22.9	1011.1						90	9	110	16	17.2
2/28	200	28 49.02	69 59.65	9.4	224	21.7	64.1	0.120E-01	22.8	1011.1						90	8	110	14	16.9
2/28	230	28 48.90	69 55.00	10.9	220	21.5	60.0	0.111E-01	22.5	1011.5						90	8	110	17	16.2
2/28	300	28 48.56	69 49.50	10.4	230	21.6	65.6	0.122E-01	22.2	1011.5						90	8	120	15	17.0
2/28	330	28 48.46	69 44.83	11.8	219	21.3	70.8	0.130E-01	21.0	1011.6	1					90	8	110	19	17.4
2/28	400	28 48.64	69 39.99	10.9	210	21.3	71.6	0.131E-01	20.9	1011.9	1					80	8	110	17	17.5
2/28	430	28 48.86	69 35.13	10.3	213	21.2	72.3	0.132E-01	21.0	1012.0	1					90	8	100	17	17.5
2/28	500	28 48.93	69 30.28	10.4	220	21.5	72.6	0.135E-01	21.0	1012.4	1					80	8	120	15	17.8
2/28	530	28 49.09	69 25.57	10.9	210	21.5	74.2	0.138E-01	21.0	1012.4	5					80	8	110	17	18.0
2/28	600	28 49.02	69 20.82	11.4	209	21.8	69.7	0.132E-01	21.0	1011.9	5					80	8	110	18	17.7
2/28	630	28 48.97	69 15.97	9.0	225	21.6	76.0	0.142E-01	21.0	1011.9	5					90	8	110	13	18.3
2/28	700	28 48.88	69 11.01	12.4	226	22.0	73.9	0.141E-01	21.0	1011.9	5					90	8	120	19	18.4
2/28	730	28 48.86	69 6.13	10.9	229	22.0	80.5	0.154E-01	21.3	1011.9	5					90	8	120	16	19.2
2/28	800	28 49.43	69 1.31	10.6	223	22.0	78.8	0.150E-01	21.5	1011.9	5					80	8	125	15	19.0
2/28	830	28 49.23	68 56.23	9.0	233	22.2	77.3	0.149E-01	21.5	1012.0	2					90	8	120	12	19.0
2/28	900	28 49.17	68 51.30	9.2	206	22.5	73.6	0.144E-01	21.5	1012.0	2					90	8	90	16	18.8
2/28	930	28 48.92	68 46.37	8.3	219	22.2	77.3	0.149E-01	21.5	1012.4	2					100	8	90	14	19.0
2/28	1000	28 48.65	68 41.68	8.5	234	21.7	80.2	0.151E-01	21.5	1012.6		1			3	90	8	120	11	18.9
2/28	1030	28 48.70	68 36.82	10.1	203	22.3	82.4	0.160E-01	21.5	1012.8	4	1			3	90	8	90	18	19.7
2/28	1100	28 48.80	68 32.08	6.7	234	21.7	81.9	0.154E-01	21.2	1013.1	2	2			3	90	8	110	8	19.1
2/28	1130	28 46.45	68 27.49	9.1	208	22.0	83.0	0.158E-01	21.3	1013.5	2	3				85	7	100	15	19.5
2/28	1200	28 47.32	68 24.90	7.4	224	22.3	80.7	0.157E-01	21.1	1013.5	2	5				180	7	30	20	19.5
2/28	1230	28 44.05	68 24.73	6.5	215	22.3	83.2	0.161E-01	21.1	1014.2	2	5				185	7	20	19	19.8
2/28	1300	28 40.36	68 24.63	7.0	205	22.3	82.3	0.160E-01	21.2	1014.8	2	5				175	7	20	20	19.7
2/28	1330	28 36.78	68 24.58	7.0	210	22.3	82.3	0.160E-01	21.1	1015.1	26	6				180	7	20	20	19.7
2/28	1400	28 33.14	68 24.34	8.2	189	22.7	79.4	0.157E-01	21.1	1015.4	4	6				190	7	0	23	19.7
2/28	1430	28 29.87	68 24.43	8.8	189	23.0	78.8	0.159E-01	21.8	1015.3	5	6				190	7	0	24	19.9
2/28	1500	28 26.48	68 24.20	6.7	189	23.1	81.3	0.165E-01	22.9	1015.7	5	6				190	8	0	21	20.3
2/28	1530	28 23.34	68 24.32	7.5	240	21.7	83.6	0.157E-01	23.1	1016.0	5	6	27	10	10	195	8	30	21	19.3
2/28	1600	28 19.93	68 24.57	6.1	218	22.5	79.2	0.155E-01	23.1	1015.7	26	6	27	10	3	185	8	20	19	19.5
2/28	1630	28 16.31	68 24.53	4.2	199	22.4	75.0	0.146E-01	22.9	1015.5	26	4	27	10	3	180	8	10	16	18.9
2/28	1700	28 12.64	68 24.34	11.9	262	21.5	82.6	0.153E-01	22.7	1015.7	7	4	27	10	4	185	8	60	26	19.0
2/28	1730	28 8.87	68 24.23	2.6	262	22.2	81.4	0.157E-01	22.7	1015.7	26	3	25	10	4	180	8	30	10	19.5
2/28	1800	28 5.90	68 25.21	9.7	179	23.3	85.6	0.176E-01	22.8	1015.5	26	3	25	10	4	270	7	290	20	21.0
2/28	1830	28 5.97	68 29.14	9.1	189	23.2	86.4	0.176E-01	22.8	1014.6	26	3	25	10	3	270	7	300	20	21.0
2/28	1900	28 5.98	68 33.05	9.7	171	23.2	86.4	0.176E-01	22.9	1014.3	46	3	25	10	4	265	8	290	20	21.0
2/28	1930	28 8.93	68 34.44	9.1	168	23.3	85.6	0.176E-01	23.0	1014.8	4	3	25	10	4	0	8	160	10	21.0
2/28	2000	28 13.07	68 34.32	9.3	174	23.5	84.1	0.174E-01	22.9	1014.6	4	3	25	10	4	355	8	180	10	21.0
2/28	2030	28 17.02	68 34.39	7.7	174	23.5	84.9	0.176E-01	23.4	1014.3	86	2	28	10	3	355	8	180	7	21.1
2/28	2100	28 21.02	68 34.50	8.0	159	23.4	86.5	0.178E-01	23.3	1013.8	86	2	27	10	4	355	8	150	8	21.2
2/28	2130	28 25.22	68 34.28	8.8	164	23.6	85.0	0.177E-01	22.5	1014.0	86	2	27	10	3	345	8	180	9	21.2

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES				SC	SS	AD	AS	TW
2/28	2200	28 28.77	68 34.90	8.7	169	23.1	88.0	0.179E-01	22.8	1014.1	15	2	28	8	3	355	8	170	9	21.1
2/28	2230	28 32.48	68 34.71	9.7	169	23.1	88.8	0.180E-01	22.9	1013.9	1	2	29	8	3	355	8	170	11	21.2
2/28	2300	28 36.03	68 34.32	9.1	163	23.1	92.3	0.187E-01	22.9	1014.1	1	2	29	8	3	355	8	160	10	21.6
2/28	2330	28 39.59	68 34.26	9.8	159	23.2	90.6	0.185E-01	22.9	1013.7						340	8	180	11	21.5
3/ 1	0	28 43.39	68 34.83	10.2	160	23.2	89.7	0.183E-01	22.8	1013.7						350	8	165	12	21.4
3/ 1	30	28 44.54	68 31.07	9.2	149	23.0	92.2	0.186E-01	22.5	1013.6						80	8	50	22	21.5
3/ 1	100	28 44.64	68 26.10	9.0	173	23.3	89.8	0.184E-01	21.8	1013.7						90	8	60	20	21.5
3/ 1	130	28 44.66	68 21.66	9.0	173	22.0	97.0	0.185E-01	21.3	1014.0						90	8	60	20	21.1
3/ 1	200	28 44.61	68 16.73	8.5	174	22.6	92.0	0.181E-01	21.4	1013.9						90	8	60	19	21.1
3/ 1	230	28 42.84	68 15.00	9.3	176	22.4	96.3	0.188E-01	21.2	1014.2						190	6	350	24	21.4
3/ 1	300	28 39.36	68 14.93	7.7	169	23.0	92.2	0.186E-01	21.2	1013.7						170	7	0	22	21.5
3/ 1	330	28 36.20	68 14.62	9.8	169	22.9	94.8	0.190E-01	21.3	1013.9						170	6	0	25	21.7
3/ 1	400	28 33.01	68 14.40	8.5	162	22.8	92.1	0.184E-01	21.6	1013.8						190	6	340	22	21.3
3/ 1	430	28 29.96	68 14.32	9.1	157	23.2	92.3	0.188E-01	22.4	1013.8						185	7	340	24	21.7
3/ 1	500	28 27.12	68 14.32	9.9	176	23.0	86.2	0.174E-01	23.1	1013.6						190	7	350	26	20.8
3/ 1	530	28 23.98	68 14.53	10.1	152	23.2	89.7	0.183E-01	23.1	1013.6						180	7	340	26	21.4
3/ 1	600	28 20.84	68 14.73	7.2	189	23.4	89.0	0.184E-01	23.0	1013.4						190	7	0	21	21.5
3/ 1	630	28 17.70	68 14.94	9.6	157	23.3	90.7	0.186E-01	22.8	1012.9						185	7	340	25	21.6
3/ 1	700	28 14.51	68 14.81	9.1	152	23.3	89.8	0.184E-01	22.8	1012.1						180	7	340	24	21.5
3/ 1	730	28 11.29	68 14.64	10.4	166	23.4	93.3	0.193E-01	22.9	1011.9						180	7	350	27	22.0
3/ 1	800	28 8.98	68 14.40	9.8	164	23.4	93.3	0.193E-01	23.0	1011.5		3	18	8	3	175	0	350	19	22.0
3/ 1	830	28 9.05	68 14.36	9.8	169	23.2	95.8	0.195E-01	23.0	1011.3		3	18	8	3	180	1	350	20	22.1
3/ 1	900	28 9.24	68 17.99	14.0	169	23.3	95.0	0.195E-01	22.5	1010.8						260	10	290	29	22.1
3/ 1	930	28 8.72	68 22.91	12.6	155	23.2	97.6	0.199E-01	23.1	1010.5						250	11	290	26	22.3
3/ 1	1000	28 8.81	68 23.94	10.8	159	23.0	100.2	0.202E-01	22.8	1010.3	3	3				260	0	260	21	22.4
3/ 1	1030	28 9.54	68 24.21	11.3	169	23.1	99.3	0.202E-01	22.8	1010.7	5	3				280	0	250	22	22.4
3/ 1	1100	28 9.95	68 23.61	10.8	169	23.1	99.3	0.202E-01	22.8	1010.3	15	3				270	0	260	21	22.4
3/ 1	1130	28 10.54	68 23.65	11.8	164	23.2	98.5	0.201E-01	22.8	1010.3	8	3				275	0	250	23	22.4
3/ 1	1200	28 11.20	68 23.59	11.3	159	23.2	97.6	0.199E-01	22.4	1010.7	18	3				260	0	260	22	22.3
3/ 1	1230	28 11.77	68 23.29	7.2	189	23.3	94.1	0.193E-01	22.8	1010.4	7	3				270	0	280	14	22.0
3/ 1	1300	28 12.17	68 23.23	11.3	175	23.4	94.2	0.194E-01	22.8	1010.5	7	4				165	1	10	23	22.1
3/ 1	1330	28 12.10	68 23.10	11.9	164	23.5	92.5	0.192E-01	22.8	1010.5	7	4				175	1	350	24	22.0
3/ 1	1400	28 12.06	68 22.91	12.4	164	24.2	90.4	0.195E-01	22.8	1010.3	5	4				175	0	350	24	22.4
3/ 1	1430	28 12.17	68 22.96	13.4	174	24.2	90.4	0.195E-01	22.8	1010.2	5	4				175	0	0	26	22.4
3/ 1	1500	28 14.41	68 24.20	14.2	163	23.8	91.9	0.194E-01	22.9	1010.1	5	4				330	9	200	19	22.2
3/ 1	1530	28 14.74	68 24.14	13.9	174	24.3	89.7	0.194E-01	22.9	1009.6	5	5				175	0	0	27	22.4
3/ 1	1600	28 14.68	68 28.89	14.4	179	25.0	85.3	0.192E-01	22.9	1009.1	7	5				180	1	0	29	22.5
3/ 1	1630	28 14.52	68 23.42	15.5	175	25.2	85.4	0.194E-01	22.8	1008.9	7	6				170	1	5	31	22.7
3/ 1	1700	28 13.72	68 22.85	16.5	174	24.6	88.2	0.194E-01	22.9	1008.2	4	6				175	3	0	35	22.5
3/ 1	1730	28 11.49	68 22.39	17.2	161	24.4	89.7	0.196E-01	22.9	1007.2	4	6				185	6	340	39	22.5
3/ 1	1800	28 9.59	68 23.21	16.9	170	24.4	89.8	0.196E-01	22.8	1006.5	4	6				205	5	330	37	22.5
3/ 1	1830	28 7.34	68 24.14	15.6	157	24.2	91.3	0.197E-01	22.9	1006.1	7	7				180	4	340	34	22.5
3/ 1	1900	28 6.19	68 26.23	14.6	171	23.2	90.7	0.185E-01	22.8	1005.3	7	7				255	7	290	30	21.5
3/ 1	1930	28 6.11	68 30.09	19.4	185	23.3	91.6	0.188E-01	22.8	1005.3	7	9				260	7	295	40	21.7
3/ 1	2000	28 6.14	68 33.39	18.3	182	23.3	92.5	0.190E-01	22.9	1004.4	76	9				260	5	290	37	21.8
3/ 1	2030	28 8.36	68 34.60	16.3	206	23.4	93.4	0.193E-01	23.0	1005.3	76	7				355	7	220	26	22.[illegible]
3/ 1	2100	28 11.86	68 34.55	15.0	217	22.6	91.2	0.180E-01	23.0	1005.3	7	8				350	7	240	25	21.0
3/ 1	2130	28 15.53	68 34.40	21.6	178	22.3	85.0	0.165E-01	23.0	1005.3	7	8				350	7	190	35	20.0
3/ 1	2200	28 18.93	68 34.42	16.3	191	23.2	87.3	0.178E-01	23.1	1004.4	7	10				340	7	220	26	21.1
3/ 1	2230	28 22.44	68 34.66	21.9	231	22.2	84.9	0.164E-01	22.9	1004.9	7	10				340	6	260	41	19.9
3/ 1	2300	28 25.79	68 34.81	15.0	200	22.6	90.3	0.178E-01	22.7	1004.4	7	10				340	6	230	25	20.9
3/ 1	2330	28 29.06	68 34.62	17.3	225	22.5	89.9	0.176E-01	22.4	1004.7		12				345	6	250	31	0.0
3/ 2	0	28 32.24	68 34.96	16.3	249	22.3	89.6	0.174E-01	22.3	1005.0						350	6	270	31	0.0
3/ 2	30	28 35.04	68 34.58	15.7	248	22.2	89.2	0.172E-01	23.8	1004.7						340	6	280	31	20.4
3/ 2	100	28 37.13	68 34.31	13.2	268	21.9	83.8	0.159E-01	22.9	1004.9						340	6	300	28	19.5
3/ 2	130	28 40.79	68 34.45	11.6	256	21.2	85.0	0.155E-01	23.0	1005.6						330	6	300	25	19.0
3/ 2	200	28 43.59	68 34.46	16.9	262	20.9	81.4	0.146E-01	22.9	1005.7						330	5	300	35	18.3
3/ 2	230	28 46.50	68 34.58	15.7	249	20.4	86.2	0.150E-01	22.4	1005.9						330	6	290	[illegible]	18.4
3/ 2	300	28 49.46	68 34.80	15.3	238	20.5	81.9	0.144E-01	22.5	1005.8						340	6	270	29	18.0
3/ 2	330	28 52.48	68 34.35	19.8	256	19.8	86.7	0.146E-01	21.4	1005.8						345	6	280	39	17.9
3/ 2	400	28 55.18	68 34.38	17.3	239	20.4	70.0	0.122E-01	21.3	1005.8						340	6	270	33	16.5
3/ 2	430	28 58.03	68 35.10	17.6	255	20.2	79.9	0.138E-01	21.3	1005.3						100	7	150	28	17.5
3/ 2	500	28 59.12	68 32.04	16.3	233	20.2	71.4	0.123E-01	21.4	1005.3						85	7	140	26	16.5
3/ 2	530	28 58.92	68 27.50	16.5	229	20.2	78.2	0.135E-01	21.4	1004.9						90	7	130	27	17.3
3/ 2	600	28 58.89	68 24.30	19.4	253	20.2	75.7	0.130E-01	21.4	1004.9						90	6	160	32	17.0
3/ 2	630	28 58.08	68 20.26	17.9	231	20.2	75.7	0.130E-01	21.6	1004.9						85	6	140	30	17.0
3/ 2	70C	28 58.90	68 16.80	19.2	239	20.0	68.7	0.117E-01	21.4	1005.3						85	6	150	32	16.0
3/ 2	730	28 57.62	68 14.16	20.3	257	20.2	75.7	0.130E-01	21.5	1004.4						190	6	60	42	17.0
3/ 2	800	28 54.47	68 13.90	20.3	262	20.0	72.9	0.124E-01	21.8	1005.3						195	6	60	42	16.5
3/ 2	830	28 51.50	68 14.02	19.2	250	[illegible]	68.7	0.117E-01	22.2	1004.9						210	6	35	42	16.0
3/ 2	900	28 48.86	68 14.74	19.5	249	20.0	[illegible]	0.117E-01	22.4	1005.3						215	6	30	43	16.0
3/ 2	930	28 45.74	68 14.74	20.0	252	19.9	67.8	0.115E-01	22.6	1006.3						190	6	55	42	0.0
3/ 2	1000	28 42.34	68 14.34	21.8	246	19.8	66.9	0.113E-01	22.8	1006.1						190	6	50	46	0.0
3/ 2	1030	28 39.07	68 14.19	18.0	301	19.8	65.9	0.111E-01	22.8	1007.0	5	15				245	5	50	38	0.0
3/ 2	1100	28 35.97	68 14.70	16.7	269	19.7	65.0	0.109E-01	22.7	1007.0	5	15				200	6	60	35	0.0
3/ 2	1130	28 32.64	68 14.85	17.3	250	19.6	64.1	0.107E-01	22.7	1008.4	2	15				180	5	70	35	0.0
3/ 2	1200	28 29.07	68 14.30	16.5	250	19.5	63.2	0.105E-01	22.6	1009.2	2	15				180	7	60	35	0.0
3/ 2	1230	28 25.77	68 14.21	16.5	260	19.4	62.3	0.103E-01	22.6	1009.9	2	18				190	7	60	35	0.0
3/ 2	1300	28 24.13	68 14.77	18.5	270	19.3	61.4	0.101E-01	22.5	1010.4	2	18				260	1	10	37	0.0
3/ 2	1330	28 23.59	68 15.17	16.9	277	19.3	60.4	0.980E-02	22.5	1011.2	2	18				210	5	60	35	0.0
3/ 2	1400	28 20.81	68 14.58	17.8	268	19.2	59.5	0.968E-02	22.8	1011.4	2	18				180	5	80	35	0.0
3/ 2	1430	28 17.50	68 14.40	17.3	268	19.1	58.6	0.948E-02	22.8	1011.5	2	18				190	5	70	35	14.0
3/ 2	1500	28 15.40	68 14.11	14.8	259	19.4	65.5	0.108E-01	22.7	1011.9	2	20				180	5	70	30	15.1
3/ 2	1530	28 12.75	68 14.01	15.0	281	19.8	64.1	0.107E-01	22.7	1012.0	2	20				270	4	10	33	15.1
3/ 2	1600	28 12.53	68 16.17	13.4	269	20.2	64.0	0.110E-01	22.7	1011.9	2	18				270	4	0	30	15.6
3/ 2	1630	28 12.41	68 18.25	14.4	264	20.8	57.6	0.103E-01	22.8	1011.5	2	18				265	4	0	32	15.3

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES		SC	SS	AD	AS	TW
3/ 2	1700	28 12.45	68 20.36	13.0	282	20.2	63.2	0.109E-01	22.8	1011.3	2	18		265	5	15	30	15.5
3/ 2	1730	28 12.44	68 23.31	14.9	265	20.4	57.9	0.101E-01	22.8	1011.0	2	10		260	5	5	34	15.0
3/ 2	1800	28 12.50	68 26.27	12.9	269	20.3	59.3	0.103E-01	22.8	1011.1	2	12		270	5	0	30	15.1
3/ 2	1830	28 11.30	68 28.98	10.9	268	20.3	59.3	0.103E-01	22.8	1011.1	2	15		280	4	350	25	15.1
3/ 2	1900	28 12.26	68 31.75	12.4	276	20.2	63.2	0.109E-01	22.9	1011.2	2	15		270	5	5	29	15.5
3/ 2	1930	28 12.96	68 34.49	14.4	283	20.2	61.6	0.106E-01	22.9	1011.8	2	15		0	6	295	30	15.3
3/ 2	2000	28 16.38	68 34.42	11.5	274	20.2	56.8	0.980E-02	22.9	1011.9	2	15		35(	7	300	25	14.7
3/ 2	2030	28 20.03	68 34.42	9.4	282	20.2	55.3	0.953E-02	22.6	1011.9	2	13		350	7	310	22	14.5
3/ 2	2100	28 23.50	68 34.59	12.8	274	19.0	67.5	0.109E-01	22.2	1011.9	2	12		345	5	300	27	15.0
3/ 2	2130	28 26.57	68 34.99	14.6	276	19.0	65.0	0.105E-01	22.6	1012.4	2	10		0	7	290	30	14.7
3/ 2	2200	28 29.80	68 34.63	12.1	273	19.1	70.2	0.114E-01	22.7	1013.1	2	10		0	7	290	25	15.4
3/ 2	2230	28 33.06	68 34.39	9.4	287	18.9	64.9	0.104E-01	22.6	1013.5	2	8		355	7	310	22	14.6
3/ 2	2300	28 36.51	68 34.51	10.4	284	18.8	66.4	0.106E-01	22.6	1013.6	2	8		350	7	310	24	14.7
3/ 2	2330	28 39.42	68 34.54	12.1	272	18.3	73.7	0.114E-01	22.4	1014.1				345	6	300	26	15.1
3/ 3	0	28 42.59	68 34.28	11.4	275	18.5	69.5	0.109E-01	21.9	1014.5				340	7	310	26	14.8
3/ 3	30	28 45.49	68 34.72	9.4	257	18.0	65.5	0.995E-02	21.3	1015.1				340	6	295	20	13.9
3/ 3	100	28 48.72	68 34.59	11.2	274	17.9	69.8	0.105E-01	21.1	1015.1				345	7	305	25	14.3
3/ 3	130	28 51.04	68 35.08	9.9	331	17.8	67.9	0.102E-01	21.0	1015.4				290	1	40	20	14.0
3/ 3	200	28 51.02	68 35.52	10.3	300	17.7	66.9	0.998E-02	21.0	1015.6				290	2	10	22	13.8
3/ 3	230	28 51.08	68 35.97	9.8	296	17.8	67.0	0.101E-01	21.0	1015.9				285	2	10	21	13.9
3/ 3	300	28 51.18	68 36.65	9.3	307	17.8	67.0	0.101E-01	21.0	1016.0				285	2	20	20	13.9
3/ 3	330	28 51.40	68 37.40	9.0	315	17.8	59.2	0.889E-02	21.1	1015.9				285	4	25	21	13.0
3/ 3	400	28 51.94	68 38.82	7.9	301	17.5	60.5	0.893E-02	21.4	1016.2				180	8	90	13	12.9
3/ 3	430	28 48.70	38 38.55	11.7	290	17.2	70.8	0.103E-01	22.9	1016.7				170	8	100	20	13.8
3/ 3	500	28 44.95	68 37.23	9.9	302	17.4	65.6	0.963E-02	22.6	1016.7	5			170	8	110	15	13.4
3/ 3	530	28 42.73	68 34.46	8.0	284	17.8	63.5	0.953E-02	22.6	1016.7	5			355	7	310	19	13.5
3/ 3	600	28 46.48	68 33.91	7.8	281	18.1	63.9	0.976E-02	22.5	1016.8	5			355	8	310	19	13.8
3/ 3	630	28 50.12	68 33.13	8.9	294	17.8	60.9	0.915E-02	21.6	1015.9	5			350	7	320	22	13.2
3/ 3	700	28 53.57	68 33.24	7.9	282	17.8	59.2	0.889E-02	21.1	1015.7	5			340	7	320	20	13.0
3/ 3	730	28 57.00	68 34.04	8.5	286	17.4	57.8	0.848E-02	21.0	1015.7	5			330	8	330	23	12.5
3/ 3	800	28 59.35	68 32.83	11.3	306	17.4	59.5	0.873E-02	20.9	1017.1				95	9	230	15	12.7
3/ 3	830	28 58.70	68 26.83	9.0	286	17.4	62.1	0.911E-02	20.9	1017.1	5			90	8	210	10	13.0
3/ 3	900	28 58.85	68 21.80	6.7	287	17.6	61.5	0.913E-02	21.1	1017.1	5			80	8	240	7	13.1
3/ 3	930	28 59.11	68 16.87	6.0	327	17.5	59.7	0.880E-02	21.2	1017.1	5			90	8	280	10	12.8
3/ 3	1000	28 56.84	68 14.09	4.4	304	17.5	58.0	0.855E-02	21.2	1016.7	5	2		190	8	60	9	12.6
3/ 3	1030	28 52.96	68 14.64	5.1	302	17.8	55.0	0.826E-02	21.2	1016.9	5	2 31	3	190	8	65	10	12.5
3/ 3	1100	28 48.85	68 14.36	8.3	299	17.9	53.5	0.808E-02	21.0	1017.4	5	2 31	3	180	8	90	14	12.4
3/ 3	1130	28 44.88	68 14.34	5.1	299	17.9	52.7	0.795E-02	21.1	1017.9	5	2 31	3	195	8	60	11	12.3
3/ 3	1200	28 40.97	68 14.66	6.6	313	18.1	56.2	0.859E-02	22.0	1018.4	5	2 31	3	185	8	90	10	12.9
3/ 3	1230	28 37.02	68 14.60	5.8	319	18.1	52.9	0.809E-02	22.3	1019.0	5	2 31	3	185	8	90	8	12.5
3/ 3	1300	28 33.01	68 14.55	4.4	294	18.3	49.2	0.760E-02	22.5	1019.3	5	2 31	3	180	8	60	9	12.2
3/ 3	1330	28 29.05	68 14.62	4.4	307	18.5	53.5	0.837E-02	22.6	1019.5	5	2 31	3	185	8	65	8	12.9
3/ 3	1400	28 25.04	68 14.39	3.9	306	18.5	49.5	0.774E-02	22.6	1019.8	5	2	2	180	8	60	7	12.4
3/ 3	1430	28 21.01	68 14.46	4.7	304	18.6	53.6	0.844E-02	22.8	1020.2	5	2	2	180	8	70	8	13.0
3/ 3	1500	28 17.17	68 14.35	5.4	295	18.5	52.7	0.824E-02	22.6	1020.2	5	2	2	180	8	70	10	12.8
3/ 3	1530	28 13.15	68 14.30	5.3	324	18.5	54.3	0.849E-02	22.7	1020.2	5	2	2	195	8	80	8	13.0
3/ 3	1600	28 9.36	68 14.47	4.7	309	19.0	57.5	0.925E-02	22.6	1020.0	5	2	2	170	8	80	6	13.8
3/ 3	1630	28 8.49	68 17.93	2.6	264	19.2	49.8	0.811E-02	22.6	1020.0	1	2 31	2	265	8	0	13	13.0
3/ 3	1700	28 8.56	68 22.38	2.6	264	19.2	52.9	0.862E-02	22.6	1019.5	1	2 30	4	265	8	0	13	13.4
3/ 3	1730	28 8.59	68 26.51	4.0	321	19.4	54.8	0.903E-02	22.7	1019.5	1	2 29	4	265	7	30	13	13.8
3/ 3	1800	28 8.55	68 30.64	2.7	290	19.3	54.7	0.895E-02	22.7	1019.0	1	2 29	5	265	8	10	13	13.7
3/ 3	1830	28 9.32	68 34.57	3.3	286	19.2	53.7	0.875E-02	22.7	1019.0	1	2 29	5	355	8	330	12	13.5
3/ 3	1900	28 13.21	68 34.49	3.3	261	18.8	52.4	0.833E-02	22.7	1018.5	1	1 30	4	355	8	320	10	13.0
3/ 3	1930	28 17.18	68 34.66	4.0	248	19.0	51.9	0.835E-02	22.7	1019.0	1	1	3	350	8	310	10	13.1
3/ 3	2000	28 21.12	68 34.33	3.0	254	19.1	52.0	0.842E-02	22.8	1019.5	1	1 34	4	355	8	320	9	13.2
3/ 3	2030	28 24.95	68 34.62	2.6	267	19.2	53.7	0.875E-02	22.6	1019.5	1	1 34	4	350	8	330	10	13.5
3/ 3	2100	28 28.69	68 34.85	3.7	242	19.2	51.4	0.836E-02	22.6	1019.5	1	1 34	3	350	8	310	9	13.2
3/ 3	2130	28 32.43	68 34.69	2.7	229	19.2	54.5	0.888E-02	22.6	1019.5	1	1 34	3	350	8	320	7	13.6
3/ 3	2200	28 36.22	68 34.89	3.3	256	19.2	55.3	0.901E-02	22.7	1019.6	1 2	1	3	350	8	320	10	13.7
3/ 3	2230	28 40.13	68 34.78	0.8	222	18.6	52.9	0.831E-02	22.6	1019.6	1 2	1	3	355	8	350	7	12.9
3/ 3	2300	28 41.21	68 34.76	4.4	253	18.6	53.7	0.844E-02	22.4	1019.8	5			350	8	310	11	13.0
3/ 3	2330	28 48.13	68 34.68	3.7	271	18.4	55.0	0.855E-02	22.4	1020.1				350	7	320	11	13.0
3/ 4	0	28 52.15	68 34.98	2.0	273	18.6	53.7	0.844E-02	22.5	1020.0				355	4	320	6	13.0
3/ 4	30	28 55.14	68 34.62	3.3	261	18.6	54.5	0.856E-02	22.4	1020.2				355	8	320	10	13.1
3/ 4	100	28 59.12	68 33.64	2.6	274	18.6	53.6	0.844E-02	22.4	1020.2				95	9	0	4	13.0
3/ 4	130	28 58.94	68 29.00	1.4	238	18.6	55.3	0.869E-02	22.4	1020.2				90	6	20	4	13.2
3/ 4	200	28 58.95	68 24.55	2.3	252	18.5	54.3	0.849E-01	22.4	1020.3				90	8	20	4	13.0
3/ 4	230	28 58.78	68 19.51	1.5	223	18.6	55.3	0.869E-02	22.2	1020.5				80	7	20	5	13.2
3/ 4	300	28 58.46	68 14.71	1.5	169	18.6	55.3	0.869E-02	21.0	1020.6				170	8	0	11	13.2
3/ 4	330	28 54.81	68 14.40	1.6	108	18.5	59.2	0.926E-02	22.0	1020.2				190	8	340	9	13.6
3/ 4	400	28 50.71	68 14.20	1.4	84	18.8	58.8	0.936E-02	22.0	1020.2				185	8	340	8	13.8
3/ 4	430	28 46.89	68 14.35	4.6	184	19.8	55.4	0.933E-02	22.3	1020.0	5			185	8	0	17	14.2
3/ 4	500	28 43.24	68 14.19	6.2	197	20.2	55.1	0.951E-02	22.4	1019.5	5			190	7	5	19	14.5
3/ 4	530	28 39.78	68 14.55	5.1	189	20.1	55.8	0.956E-02	22.6	1019.5	5			190	8	0	18	14.5
3/ 4	600	28 36.26	68 14.68	4.4	209	20.0	57.2	0.975E-02	22.3	1019.5	5			180	8	15	16	14.6
3/ 4	630	28 32.87	68 14.70	6.4	203	19.8	59.3	0.100E-01	22.5	1019.0	5			180	7	15	19	14.7
3/ 4	700	28 29.42	68 14.39	6.4	203	19.8	59.3	0.100E-01	22.6	1018.5	5			180	7	15	19	14.7
3/ 4	730	28 26.02	68 14.42	5.1	216	19.8	61.7	0.104E-01	22.6	1018.5	5			180	8	20	17	15.0
3/ 4	800	28 22.41	68 13.86	6.8	196	19.8	63.4	0.107E-01	22.6	1018.7	5			180	8	10	21	15.2
3/ 4	830	28 19.10	68 14.60	6.1	223	19.6	60.7	0.101E-01	21.9	1019.5	5			190	8	20	19	14.7
3/ 4	900	28 15.53	68 14.68	7.6	268	19.6	57 ,	0.957E-02	22.5	1019.3	5			180	8	60	17	14.3
3/ 4	930	28 11.96	68 14.61	6.1	248	19.6	57.5	0.957E-02	22.5	1019.7	8			175	8	45	16	14.3
3/ 4	1000	28 8.31	68 14.81	5.8	253	20.1	58.1	0.996E-02	22.5	1019.4				270	7	350	18	14.8
3/ 4	1030	28 8.63	68 18.72	5.6	235	20.4	56.9	0.993E-02	22.5	1019.8	11	1	3	270	8	340	18	14.9
3/ 4	1100	28 8.56	68 22.69	4.2	246	19.9	52.4	0.888E-02	22.5	1019.8	11	1	3	265	7	350	15	13.9
3/ 4	1130	28 8.42	68 27.09	4.1	224	20.0	53.3	0.908E-02	22.5	1020.2	114	1	3	265	8	340	15	14.1

Table Vb-3 (Cont)

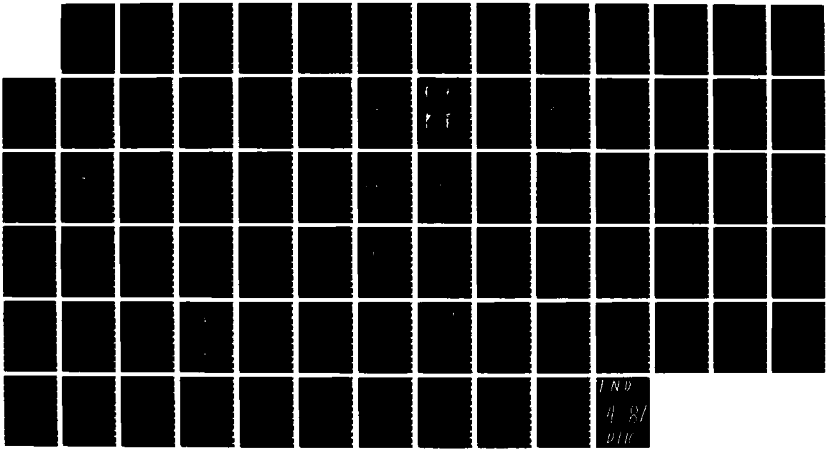
DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES		SC	SS	AD	AS	TV
3/ 4	1200	28 8.61	68 31.09	4.6	208	20.1	51.9	0.890E-02	22.3	1020.2		1	3	265	8	330	13	14.0
3/ 4	1230	28 8.57	68 34.93	6.5	215	20.1	55.8	0.956E-02	22.7	1020.2	7	1	3	290	7	310	16	14.5
3/ 4	1300	28 10.44	68 34.96	6.1	203	20.3	56.8	0.985E-02	22.7	1020.4	17	1	3	40	2	160	10	14.8
3/ 4	1330	28 11.10	68 33.64	4.7	218	21.3	58.1	0.107E-01	22.7	1020.8	17	1	3	80	12	50	8	15.8
3/ 4	1400	28 12.63	68 26.32	5.0	232	20.6	56.4	0.995E-02	22.7	1020.7	37	1	3	80	14	40	7	15.0
3/ 4	1430	28 13.55	68 19.53	5.1	220	20.5	57.8	0.101E-01	22.7	1020.7	31	1	3	100	2	110	9	15.1
3/ 4	1500	28 13.58	68 18.73	5.7	204	20.7	59.7	0.106E-01	22.7	1020.4	21	1	3	135	0	70	11	15.5
3/ 4	1530	28 13.67	68 18.25	6.5	203	20.8	56.7	0.101E-01	22.7	1020.2	32	1	3	140	1	60	13	15.2
3/ 4	1600	28 13.76	68 17.71	5.9	204	20.8	61.4	0.109E-01	22.7	1020.2	12	1	3	140	1	60	12	15.8
3/ 4	1630	28 17.34	68 16.98	6.1	194	21.2	61.8	0.113E-01	22.7	1020.4	112	1	3	0	11	0	11	16.2
3/ 4	1700	28 18.22	68 16.47	6.2	184	21.2	64.2	0.117E-01	22.7	1019.8	172	1	3	145	0	40	12	16.5
3/ 4	1730	28 18.25	68 16.14	5.7	209	21.8	60.3	0.114E-01	22.8	1019.5	172	1	2	145	0	65	11	16.5
3/ 4	1800	28 18.43	68 15.87	5.1	179	21.8	56.5	0.107E-01	22.7	1019.0	172	1	2	120	0	60	10	16.0
3/ 4	1830	28 22.34	68 15.00	6.7	179	21.4	59.0	0.109E-01	22.8	1018.5	172	1	2	120	0	60	13	16.0
3/ 4	1900	28 23.09	68 14.49	6.2	189	21.6	56.3	0.105E-01	22.8	1018.4	172	1	1	130	0	60	12	15.8
3/ 4	1930	28 23.39	68 14.08	6.7	194	21.4	59.0	0.109E-01	22.8	1018.5	272	1	1	135	0	60	13	16.0
3/ 4	2000	28 23.64	68 13.80	5.7	198	22.6	55.4	0.109E-01	22.7	1018.1	272	1	1	10	10	240	2	16.5
3/ 4	2030	28 27.58	68 12.78	5.4	220	21.8	56.5	0.107E-01	22.8	1018.5	272	1	1	345	1	240	10	16.0
3/ 4	2100	28 27.98	68 12.51	5.6	192	21.5	58.4	0.108E-01	22.8	1018.5	2 2	1	1	345	1	210	10	16.0
3/ 4	2130	28 28.36	68 12.25	4.1	189	21.5	62.2	0.115E-01	22.7	1018.5	1 2	1	1	310	0	240	8	16.5
3/ 4	2200	28 30.74	68 11.26	5.9	204	22.0	59.0	0.113E-01	22.8	1018.0	1 1	1	2	10	10	250	3	16.5
3/ 4	2230	28 32.67	68 9.92	6.2	194	21.6	64.7	0.121E-01	22.5	1018.1	2 1	1	2	155	0	40	12	16.9
3/ 4	2300	28 32.97	68 9.42	5.7	179	21.5	67.7	0.126E-01	22.5	1017.9	3 1	1	2	120	0	60	11	17.2
3/ 4	2330	28 33.12	68 8.31	6.7	179	21.8	65.7	0.124E-01	22.6	1017.9				120	0	60	13	17.2
3/ 5	0	28 34.62	68 8.18	6.5	191	21.6	61.6	0.115E-01	22.6	1018.5				350	10	250	5	16.5
3/ 5	30	28 37.01	68 8.11	7.[illegible]	179	22.0	69.0	0.132E-01	22.6	1018.5				120	0	60	15	17.8
3/ 5	100	28 36.97	68 7.57	6.7	194	21.9	65.8	0.125E-01	22.7	1018.4				185	0	10	13	17.3
3/ 4	130	28 36.88	68 7.11	6.2	199	21.9	65.0	0.123E-01	22.6	1018.5				190	0	10	12	17.2
3/ 5	200	28 36.60	68 6.48	6.7	200	21.7	64.0	0.120E-01	22.6	1018.4				190	1	10	14	16.9
3/ 5	230	28 39.64	68 6.58	6.6	208	21.6	69.4	0.130E-01	22.7	1018.5				350	10	270	8	17.5
3/ 5	300	28 41.49	68 7.22	6.7	199	21.8	68.0	0.128E-01	22.6	1017.7				200	1	0	14	17.5
3/ 5	330	28 41.49	68 6.84	7.2	188	21.8	67.3	0.127E-01	22.6	1017.5				210	1	340	15	17.4
3/ 5	400	28 41.54	68 6.59	9.3	199	21.8	68.0	0.128E-01	22.5	1017.[illegible]				210	0	350	18	17.5
3/ 5	430	28 42.04	68 6.11	10.2	189	21.4	72.4	0.134E-01	22.5	1017.6	5			30	10	140	11	17.7
3/ 5	500	28 45.94	68 3.97	8.9	177	21.3	75.6	0.139E-01	22.5	1017.1	5			230	1	310	18	18.0
3/ 5	530	28 46.09	68 3.83	8.8	178	21.5	70.9	0.132E-01	22.6	1016.5				210	1	330	18	17.6
3/ 5	600	28 46.27	68 3.93	9.3	174	21.5	75.8	0.141E-01	22.6	1015.7				215	0	320	18	18.2
3/ 5	630	28 47.76	68 2.81	10.1	174	21.4	74.9	0.138E-01	22.6	1015.7				5	10	160	10	18.0
3/ 5	700	28 50.66	68 1.17	8.8	163	21.7	76.9	0.144E-01	22.5	1015.2				195	1	330	18	18.5
3/ 5	730	28 50.67	68 1.01	8.2	179	21.6	77.6	0.145E-01	22.5	1014.8	5			190	0	350	16	18.5
3/ 5	800	28 50.56	68 0.32	8.2	179	21.8	77.0	0.145E-01	22.5	1014.3	5			200	0	340	16	18.6
3/ 5	830	28 51.69	67 59.57	10.3	179	21.6	83.5	0.156E-01	22.5	1013.8	5			5	10	170	10	19.2
3/ 5	900	28 55.22	67 58.82	8.2	164	21.8	82.0	0.155E-01	22.5	1013.6	5			150	0	15	16	19.2
3/ 5	930	28 55.00	67 57.86	7.7	169	22.0	81.3	0.155E-01	22.5	1013.4	5			180	0	350	15	19.3
3/ 5	1000	28 54.82	67 56.89	8.2	179	21.5	88.7	0.165E-01	22.4	1013.5		1	3	180	0	0	16	19.7
3/ 5	1030	28 54.47	67 56.01	6.7	179	21.6	87.0	0.162E-01	22.5	1013.5	7	1	3	180	0	0	13	19.6
3/ 5	1100	28 54.05	67 55.03	9.2	178	21.2	92.0	0.168E-01	22.5	1013.5	5	2	3	340	10	220	9	19.8
3/ 5	1130	28 58.19	67 56.94	8.4	172	21.7	90.6	0.170E-01	22.4	1013.1	5	3 27	3	330	10	230	8	20.1
3/ 5	1200	28 59.90	67 57.03	7.7	204	22.1	97.9	0.188E-01	22.5	1012.8	5	3 27	3	180	0	25	15	21.3
3/ 5	1230	28 59.51	67 55.83	8.8	184	22.0	91.6	0.175E-01	22.5	1012.8	5	3		195	0	350	17	20.5
3/ 5	1300	28 59.26	67 55.22	9.3	189	22.[illegible]	84.5	0.170E-01	22.5	1013.1	5	3		190	0	0	18	20.5
3/ 5	1330	28 59.82	67 54.86	4.1	189	22.7	81.0	0.161E-01	22.5	1012.9	42	3		350	0	200	8	19.9
3/ 5	1400	29 4.05	67 55.24	8.0	185	22.5	88.4	0.174E-01	22.5	1013.1	5	3		345	5	210	11	20.6
3/ 5	1430	29 4.29	67 54.67	10.3	184	23.2	86.4	0.176E-01	22.4	1012.7	5	3		195	1	350	21	21.0
3/ 5	1500	29 3.88	67 53.96	9.3	184	23.8	75.6	0.159E-01	22.5	1012.3	5	3		195	1	350	19	20.2
3/ 5	1530	29 9.45	67 54.75	10.9	198	22.8	88.6	0.177E-01	22.5	1012.4	5	4		220	2	340	23	20.9
3/ 5	1600	29 4.38	67 54.10	11.3	210	23.2	86.4	0.176E-01	22.4	1011.7	8	4 24	4	200	1	10	23	21.0
3/ 5	1630	29 4.13	67 53.56	10.8	199	23.2	87.2	0.178E-01	22.4	1011.0	8	4 24	4	200	1	0	22	21.1
3/ 5	1700	29 6.38	67 52.66	17.0	197	22.6	88.5	0.175E-01	22.2	1011.0	8	5 24	4	355	9	210	25	20.7
3/ 5	1730	29 9.34	67 52.28	12.4	219	23.4	80.0	0.165E-01	21.2	1010.5	5	5 24	4	220	1	0	25	20.4
3/ 5	1800	29 9.16	67 52.05	11.3	224	23.2	82.3	0.168E-01	21.3	1010.8	5	5 23	4	225	1	0	23	20.5
3/ 5	1830	29 8.84	67 51.67	11.9	240	22.5	83.4	0.164E-01	21.6	1010.1	67	4 23	4	220	1	20	24	20.0
3/ 5	1900	29 10.95	67 50.77	12.9	246	22.5	81.7	0.160E-01	21.3	1010.1	67	4 24	2	0	10	270	23	19.8
3/ 5	1930	29 14.07	67 50.41	11.8	239	22.7	79.4	0.158E-01	21.6	1010.1	472	3 27	6	240	0	0	23	19.7
3/ 5	2000	29 14.10	67 50.52	12.4	249	22.6	74.5	0.147E-01	21.6	1010.1	372	3 27	6	240	0	10	24	19.0
3/ 5	2030	29 13.89	67 50.42	13.4	254	22.5	72.8	0.143E-01	21.5	1010.1	672	3 27	6	235	0	20	26	18.7
3/ 5	2100	29 13.86	67 50.10	12.2	287	21.4	76.6	0.141E-01	21.6	1011.2	472	3 27	6	170	11	90	21	18.2
3/ 5	2130	29 8.30	67 48.70	12.2	282	20.8	79.5	0.142E-01	21.7	1011.5	472	3 27	6	165	11	90	21	18.0
3/ 5	2200	29 4.36	67 47.57	12.0	280	21.3	75.7	0.139E-01	21.9	1011.8	28	3 27	6	165	10	90	21	18.0
3/ 5	2230	28 59.78	67 46.99	11.8	304	21.5	78.4	0.145E-01	22.0	1011.7	18	3 27	6	195	0	110	23	18.5
3/ 5	2300	28 59.33	67 45.99	11.8	284	21.9	68.2	0.129E-01	22.4	1012.8	25	3 27	6	285	2	0	25	17.6
3/ 5	2330	28 57.70	67 47.19	12.9	289	21.6	64.0	0.119E-01	22.3	1013.1				290	2	0	27	16.8
3/ 6	0	28 56.06	67 48.39	11.2	303	20.9	72.0	0.129E-01	22.6	1013.9				220	10	60	25	17.2
3/ 6	30	28 51.90	67 51.74	11.6	291	20.7	69.3	0.123E-01	22.3	1014.1				220	11	50	28	16.7
3/ 6	100	28 47.93	67 55.14	8.8	299	20.4	67.4	0.117E-01	22.4	1015.0				220	11	50	22	16.2
3/ 6	130	28 43.94	67 58.43	8.9	313	20.3	71.4	0.124E-01	22.7	1015.6				220	11	60	20	16.6
3/ 6	200	28 39.66	68 2.36	9.1	293	20.4	69.8	0.122E-01	22.6	1015.7				220	9	50	22	16.5
3/ 6	230	28 35.76	68 6.06	9.4	305	20.2	73.8	0.127E-01	22.4	1016.1				220	9	60	21	16.8
3/ 6	300	28 31.35	68 9.93	6.7	310	20.2	70.4	0.121E-01	22.6	1016.5				220	11	50	17	16.4
3/ 6	330	28 27.25	68 13.47	6.7	310	20.2	72.1	0.124E-01	22.7	1016.5				220	11	50	17	16.6
3/ 6	400	28 23.29	68 17.95	7.7	319	19.9	71.0	0.120E-01	22.7	1016.9				220	11	60	17	16.2
3/ 6	430	28 19.26	68 22.14	7.6	315	20.0	68.6	0.117E-01	22.7	1016.7				220	10	60	17	16.0
3/ 6	500	28 15.33	68 26.32	4.6	306	19.8	70.0	0.118E-01	22.7	1016.8				215	11	40	14	16.0
3/ 6	530	28 11.08	68 29.84	4.4	285	19.8	65.9	0.111E-01	22.6	1016.7				215	11	30	16	15.5
3/ 6	600	28 6.67	68 33.87	6.4	325	20.0	66.9	0.114E-01	22.6	1016.7				185	11	80	8	15.8
3/ 6	630	28 2.28	68 36.42	5.0	324	19.8	67.5	0.114E-01	23.3	1016.7				215	11	50	12	15.7

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES		SC	SS	AD	AS	TV
3/ 6	700	27 58.10	68 40.04	3.6	308	20.0	66.1	0.113E-01	23.3	1016.7				220	12	30	14	15.7
3/ 6	730	27 54.18	68 44.22	5.0	340	20.0	66.9	0.114E-01	23.7	1015.9				220	12	50	11	15.8
3/ 6	800	27 50.09	68 48.27	3.7	337	20.0	67.7	0.115E-01	23.7	1016.0				220	11	40	10	15.9
3/ 6	830	27 46.00	68 52.20	2.4	310	20.0	62.8	0.107E-01	23.5	1016.7				220	10	25	11	15.3
3/ 6	900	27 42.80	68 56.31	4.3	317	20.2	65.5	0.113E-01	23.5	1016.2				220	11	40	13	15.8
3/ 6	930	27 38.12	69 0.42	2.3	1	20.2	66.3	0.114E-01	23.0	1015.7				220	11	20	8	15.9
3/ 6	1000	27 33.91	69 4.12	0.0	148	20.2	62.3	0.107E-01	23.1	1016.5		1 32	3	210	11	0	11	15.4
3/ 6	1030	27 29.57	69 7.24	1.6	161	20.2	59.9	0.103E-01	23.4	1016.7	4	1 32	3	215	12	350	14	15.1
3/ 6	1100	27 25.28	69 10.72	1.2	144	20.4	58.6	0.102E-01	23.4	1016.9	4	1 32	3	215	12	350	13	15.1
3/ 6	1130	27 21.02	69 14.61	1.6	161	20.6	57.3	0.101E-01	23.5	1017.5	4	1 32	3	215	12	350	14	15.1
3/ 6	1200	27 16.64	69 17.86	1.4	73	20.4	61.7	0.108E-01	23.5	1017.4		1 28	3	215	12	350	10	15.5
3/ 6	1230	27 16.99	69 23.49	1.8	212	20.6	56.5	0.996E-02	23.7	1017.6	4	1 28	3	275	10	345	12	15.0
3/ 6	1300	27 18.08	69 29.27	0.5	84	19.9	59.5	0.101E-01	23.7	1018.0	5	1 28	3	265	12	0	11	14.8
3/ 6	1330	27 18.50	69 34.82	2.1	199	20.3	58.4	0.101E-01	23.9	1018.3		1 28	3	270	9	340	11	15.0
3/ 6	1400	27 18.91	69 40.26	2.7	159	20.5	55.6	0.974E-02	23.6	1018.4		1 28	3	265	10	330	10	14.8
3/ 6	1430	27 18.86	69 45.48	2.7	183	20.8	55.2	0.985E-02	23.7	1018.3		1 28	3	255	7	330	10	15.0
3/ 6	1500	27 18.41	69 51.09	4.0	140	20.9	63.9	0.115E-01	23.8	1018.1		1 28	3	265	12	320	10	16.2
3/ 6	1530	27 18.38	69 57.43	6.0	163	21.3	59.7	0.110E-01	23.9	1017.7		1 28	3	265	12	310	15	16.0
3/ 6	1600	27 18.52	70 2.78	4.2	167	21.1	58.7	0.106E-01	24.0	1017.6		1 28	3	265	1	270	8	15.7
3/ 6	1630	27 15.55	69 59.21	3.6	185	21.5	61.5	0.114E-01	24.0	1017.6		1 28	3	130	12	20	17	16.4
3/ 6	1700	27 12.11	69 55.55	5.7	160	22.0	61.3	0.117E-01	24.0	1016.7		1 28	3	145	6	10	17	16.8
3/ 6	1730	27 8.56	69 51.62	5.0	175	22.2	60.1	0.116E-01	24.0	1015.8		1 28	3	130	12	20	20	16.8
3/ 6	1800	27 5.33	69 46.35	5.7	164	22.5	61.9	0.122E-01	23.9	1015.7		1 26	3	165	5	0	16	17.3
3/ 6	1830	27 8.97	69 43.49	6.0	185	22.2	64.6	0.125E-01	24.0	1015.7		1 26	3	25	11	90	4	17.4
3/ 6	1900	27 13.90	69 40.49	6.0	180	22.2	63.8	0.123E-01	24.0	1015.7	1	1 26	3	20	11	90	4	17.3
3/ 6	1930	27 18.90	69 37.98	7.3	206	22.2	63.3	0.123E-01	24.0	1015.7	1	1 26	3	305	2	270	14	17.3
3/ 6	2000	27 19.07	69 37.95	8.2	219	22.3	68.6	0.133E-01	24.0	1015.2	1	1 26	3	220	2	0	18	18.0
3/ 6	2030	27 19.23	69 38.01	5.7	239	22.2	65.4	0.126E-01	24.0	1015.7	1	1 26	3	340	0	260	11	17.5
3/ 6	2100	27 19.82	69 38.39	9.3	224	22.2	61.6	0.119E-01	24.0	1015.7	1	1 26	3	45	10	180	8	17.0
3/ 6	2130	27 22.11	69 34.92	7.6	227	22.2	65.4	0.126E-01	23.8	1015.7	1	1 26	3	180	3	40	17	17.5
3/ 6	2200	27 21.58	69 33.77	8.5	220	22.1	64.5	0.124E-01	23.9	1015.0	1	2	2	185	3	30	19	17.3
3/ 6	2230	27 19.27	69 33.92	7.1	216	21.9	73.0	0.138E-01	23.8	1015.0	1	2	2	185	8	20	21	18.2
3/ 6	2300	27 15.87	69 33.97	7.6	210	22.2	69.3	0.134E-01	23.8	1014.6	1	2	2	180	8	20	22	18.0
3/ 6	2330	27 12.57	69 33.76	7.1	221	22.2	68.5	0.132E-01	24.0	1015.1	1	2	2	190	8	20	21	17.9
3/ 7	0	27 9.25	69 34.22	8.8	230	22.7	70.6	0.140E-01	24.2	1015.6				180	8	35	23	18.6
3/ 7	30	27 6.20	69 34.06	8.3	241	22.8	68.3	0.136E-01	24.2	1015.7				190	8	35	22	18.4
3/ 7	100	27 2.58	69 34.03	8.5	233	22.9	70.8	0.142E-01	24.1	1015.8				190	8	30	23	[illegible]
3/ 7	130	26 58.89	69 33.97	8.1	210	23.2	71.1	0.145E-01	24.3	1015.9				180	8	20	23	[illegible]
3/ 7	200	26 55.42	69 34.12	8.6	200	23.2	70.3	0.143E-01	24.3	1016.3				230	8	340	24	19.0
3/ 7	230	26 54.04	69 36.92	8.8	228	23.3	68.1	0.140E-01	24.3	1016.4				265	8	335	24	[illegible]
3/ 7	300	26 54.01	69 40.54	7.1	233	23.4	65.2	0.134E-01	24.5	1016.1				265	8	340	21	[illegible]
3/ 7	330	26 54.03	69 44.25	7.5	219	23.1	70.2	0.142E-01	24.4	1016.0				265	8	330	21	[illegible]
3/ 7	400	26 54.09	69 48.13	5.4	238	23.2	67.2	0.137E-01	24.4	1015.7				265	8	345	18	18.6
3/ 7	430	26 54.11	69 51.99	6.5	216	23.2	70.3	0.143E-01	24.3	1015.8				265	8	330	[illegible]	[illegible]
3/ 7	500	26 54.14	69 55.74	6.1	215	23.2	74.2	0.151E-01	24.3	1015.7				265	8	330	[illegible]	[illegible]
3/ 7	530	26 54.23	69 59.85	7.0	217	23.2	75.0	0.153E-01	24.3	1015.7				265	8	330	[illegible]	[illegible]
3/ 7	600	26 54.25	70 3.87	7.5	214	23.0	79.6	0.161E-01	24.1	1015.6				260	8	330	[illegible]	[illegible]
3/ 7	630	26 57.10	70 5.29	5.8	219	23.0	80.4	0.162E-01	24.1	1014.8				355	8	[illegible]	[illegible]	[illegible]
3/ 7	700	27 1.45	70 5.61	8.1	244	23.0	79.6	0.161E-01	23.9	1014.6				355	8	[illegible]	[illegible]	[illegible]
3/ 7	730	27 5.34	70 5.40	7.2	217	22.6	82.6	0.163E-01	23.6	1014.3				[illegible]	8	[illegible]	[illegible]	[illegible]
3/ 7	800	27 9.45	70 5.55	9.7	204	22.5	87.6	0.172E-01	23.6	1013.9				[illegible]	8	[illegible]	[illegible]	[illegible]
3/ 7	830	27 13.42	70 5.65	10.8	223	22.4	86.7	0.169E-01	23.8	1014.4				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3/ 7	900	27 17.37	70 5.34	8.5	222	22.3	83.2	0.161E-01	23.7	1014.0				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3/ 7	930	27 21.16	70 5.46	6.7	219	22.3	85.7	0.166E-01	23.8	1014.1				[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3/ 7	1000	27 22.71	70 2.05	6.7	227	22.0	91.6	0.175E-01	23.7	1014.1				[illegible]	[illegible]	[illegible]		
3/ 7	1030	27 22.77	69 57.91	7.7	239	22.6	79.3	0.156E-01	23.5	1015.1	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		
3/ 7	1100	27 22.54	69 53.75	6.9	221	22.6	83.4	0.165E-01	23.5	1014.4	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		
3/ 7	1130	27 22.83	69 49.79	6.7	227	22.6	81.7	0.161E-01	23.6	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]		
3/ 7	1200	27 22.67	69 45.40	5.7	243	22.7	80.2	0.159E-01	23.6	[illegible]	[illegible]	[illegible]		[illegible]				
3/ 7	1230	27 22.66	69 40.79	5.9	230	22.8	82.7	0.165E-01	23.5	[illegible]	[illegible]			[illegible]				
3/ 7	1300	27 22.74	69 36.15	4.9	242	23.4	84.8	0.175E-01	[illegible]	[illegible]	[illegible]			[illegible]				
3/ 7	1330	27 20.38	69 33.93	3.6	222	22.9	81.2	0.163E-01	[illegible]	[illegible]	[illegible]			[illegible]				
3/ 7	1400	27 16.53	69 34.08	5.1	211	23.0	83.7	0.169E-01	[illegible]	[illegible]	[illegible]							
3/ 7	1430	27 13.07	69 34.02	5.9	238	23.0	78.8	0.159E-01	[illegible]	[illegible]	[illegible]			[illegible]				
3/ 7	1500	27 9.46	69 34.02	4.7	281	22.8	81.1	0.162E-01	[illegible]	[illegible]	[illegible]			[illegible]				
3/ 7	1530	27 5.62	69 33.76	7.5	245	23.3	76.6	[illegible]	[illegible]	[illegible]	[illegible]							
3/ 7	1600	27 1.76	69 33.94	7.3	260	23.4	[illegible]	[illegible]	[illegible]	[illegible]								
3/ 7	1630	26 57.40	69 34.08	7.2	262	23.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]							
3/ 7	1700	26 54.10	69 34.57	6.7	272	23.4	[illegible]	[illegible]	[illegible]	[illegible]								
3/ 7	1730	26 54.11	69 38.38	5.8	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
3/ 7	1800	26 54.10	69 42.35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								
3/ 7	1830	26 54.05	69 46.41	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]									
3/ 7	1900	26 54.09	69 50.44	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]									
3/ 7	1930	26 54.17	69 54.52	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]									
3/ 7	2000	26 54.19	69 58.66	[illegible]	[illegible]	[illegible]		[illegible]										
3/ 7	2030	26 54.15	70 [illegible]	[illegible]	[illegible]	[illegible]		[illegible]										
3/ 7	2100	26 56.42	70 [illegible]	[illegible]	[illegible]			[illegible]										
3/ 7	2130	27 [illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]										
3/ 7	2200	[illegible]	[illegible]	[illegible]				[illegible]										
3/ 7	2230	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]										
3/ 7	2300	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]										
3/ 7	2330	[illegible]	[illegible]	[illegible]	[illegible]			[illegible]										
3/ 8	0	[illegible]	[illegible]	[illegible]	[illegible]													
3/ 8	30	[illegible]	[illegible]		[illegible]													
3/ 8	100	[illegible]	[illegible]		[illegible]													
3/ 8	130	[illegible]	[illegible]		[illegible]													
3/ 8	200	[illegible]	[illegible]		[illegible]													
3/ 8	[illegible]	[illegible]	[illegible]															

AD-A177 776 FASINEX (FRONTAL AIR-SEA INTERACTION EXPERIMENT JANUARY - JUNE 1986) CRUI..(U) WOODS HOLE OCEANOGRAPHIC INSTITUTION MA N J PENNINGTON ET AL. OCT 86 WHOI-86-36 2/2

UNCLASSIFIED N00014-84-C-0134 F/G 8/3 NL



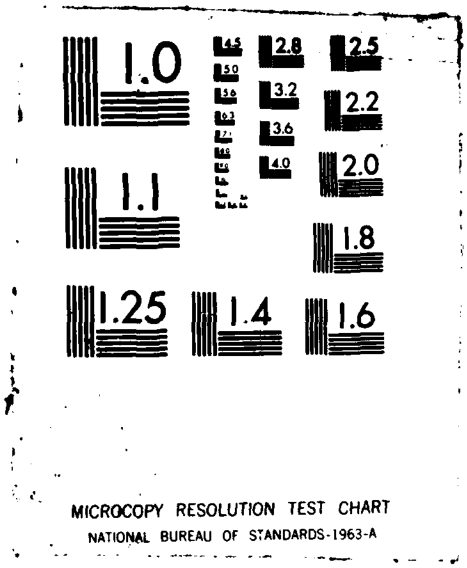

1.0
4.5
5.0
5.6
6.3
2.8
3.2
3.6
4.0
2.5
2.2
2.0
1.1
1.8
1.25
1.4
1.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table Vb-3 (Cont)

DATE	TIME	LAT	LONG	WS	WD	AT	RH	ABS HUM	SST	BP	CLOUD	WAVES		SC	SS	AD	AS	TW
3/ 8	300	27 22.39	69 40.96	5.4	273	22.1	65.3	0.125E-01	23.7	1016.8				85	8	220	3	17.4
3/ 8	330	27 22.40	69 36.75	6.3	280	22.1	66.8	0.128E-01	23.5	1016.8				85	8	220	5	17.6
3/ 8	400	27 20.99	69 33.78	4.0	291	22.0	66.7	0.127E-01	23.5	1017.6				190	8	50	10	17.5
3/ 8	430	27 17.22	69 33.97	5.5	285	22.2	65.4	0.126E-01	23.7	1016.8				185	8	60	12	17.5
3/ 8	500	27 13.65	69 33.79	4.7	281	22.2	67.7	0.131E-01	24.0	1017.6				190	8	50	12	17.8
3/ 8	530	27 10.19	69 33.83	4.9	281	22.2	65.4	0.126E-01	24.3	1017.1				0	0	0	0	17.5
3/ 8	600	27 6.63	69 34.01	5.1	281	22.2	63.1	0.122E-01	24.3	1016.8				185	8	55	12	17.2
3/ 8	630	27 3.10	69 34.33	4.7	285	22.2	67.7	0.131E-01	24.3	1016.7				185	8	55	11	17.8
3/ 8	700	26 59.49	69 34.39	5.5	273	22.2	70.8	0.137E-01	24.3	1017.0				175	8	60	12	18.2
3/ 8	730	26 55.73	69 34.13	4.7	271	22.2	66.9	0.129E-01	24.3	1016.7				180	8	50	12	17.7
3/ 8	800	26 52.25	69 35.26	6.3	304	22.3	68.6	0.133E-01	24.2	1016.7				210	8	60	14	18.0
3/ 8	830	26 49.07	69 37.40	6.3	304	22.3	66.2	0.129E-01	24.3	1016.7				210	8	60	14	17.7
3/ 8	900	26 45.94	69 39.63	6.3	299	22.3	68.6	0.133E-01	24.4	1017.6				205	8	60	14	18.0
3/ 8	930	26 42.76	69 41.84	4.7	296	22.4	64.0	0.125E-01	24.5	1017.6				205	8	50	12	17.5
3/ 8	1000	26 39.36	69 43.67	5.1	292	22.2	67.7	0.131E-01	24.4	1017.7	1	1 32	3	205	8	50	13	17.8
3/ 8	1030	26 36.24	69 45.95	3.3	298	22.3	65.5	0.127E-01	24.4	1018.1	1	1 32	3	205	8	40	10	17.6
3/ 8	1100	26 32.91	69 47.90	4.4	281	22.9	63.1	0.127E-01	24.3	1018.4	1	1 32	3	205	8	40	13	17.8
3/ 8	1130	26 29.92	69 50.56	4.7	291	22.7	64.4	0.128E-01	24.5	1018.6	1	1 32	3	200	8	50	12	17.8
3/ 8	1200	26 28.30	69 51.11	5.7	285	22.8	62.2	0.124E-01	24.4	1019.0	2	1 32	3	190	1	90	11	17.6
3/ 8	1230	26 27.97	69 51.15	5.1	289	22.9	61.6	0.124E-01	24.5	1019.6	4	1 32	4	230	0	60	10	17.6
3/ 8	1300	26 27.83	69 52.02	5.2	295	22.6	62.7	0.124E-01	24.5	1020.2	4	1 32	4	290	2	5	12	17.5
3/ 8	1330	26 28.04	69 52.88	7.2	294	22.6	62.7	0.124E-01	24.5	1020.5	2	1 32	4	235	0	60	14	17.5
3/ 8	1400	26 27.81	69 52.86	5.1	299	22.7	58.4	0.116E-01	24.5	1020.8	4	1 32	4	220	0	80	10	17.0
3/ 8	1430	26 27.66	69 53.09	5.7	334	22.8	57.0	0.114E-01	24.5	1021.0	4	1 32	5	235	0	100	11	16.9
3/ 8	1500	26 29.97	69 54.57	7.4	322	22.9	60.1	0.121E-01	24.5	1020.9	1	1 32	5	340	11	350	25	17.4
3/ 8	1530	26 35.77	69 57.19	5.4	312	22.8	62.9	0.126E-01	24.5	1021.1		2 32	5	335	13	350	23	17.7
3/ 8	1600	26 42.06	69 59.97	5.7	334	23.2	59.0	0.120E-01	24.5	1021.6		2 32	5	335	13	0	24	17.5
3/ 8	1630	26 48.30	70 2.76	7.0	295	23.0	55.1	0.111E-01	24.4	1021.5		3 33	4	335	13	340	25	16.8
3/ 8	1700	26 54.18	70 5.44	5.7	314	22.5	57.4	0.113E-01	24.3	1021.9		3 33	3	315	0	0	11	16.7
3/ 8	1730	26 54.69	70 5.58	5.0	281	22.4	54.3	0.106E-01	24.4	1022.1		3 34	3	65	1	220	9	16.2
3/ 8	1800	26 54.97	70 5.57	5.6	347	22.3	57.1	0.111E-01	24.6	1021.4		3 34	3	140	1	210	10	16.5
3/ 8	1830	26 55.06	70 5.27	7.2	344	22.5	59.6	0.117E-01	24.5	1021.4		3 34	3	95	14	305	16	17.0
3/ 8	1900	26 54.77	69 58.21	7.2	334	22.5	58.1	0.114E-01	24.5	1021.2		3 34	3	95	14	300	14	16.8
3/ 8	1930	26 54.32	69 51.10	8.1	339	22.2	63.8	0.123E-01	24.5	1021.4		3 34	3	90	14	300	17	17.3
3/ 8	2000	26 54.39	69 43.92	7.8	336	22.4	60.2	0.118E-01	24.4	1021.4		3 34	3	90	14	300	16	17.0
3/ 8	2030	26 54.67	69 37.24	6.3	349	22.2	61.5	0.119E-01	24.4	1021.4		3 34	3	100	14	310	15	17.0
3/ 8	2100	26 53.93	69 34.14	4.6	349	22.4	60.2	0.118E-01	24.5	1021.9		2 34	2	350	1	0	10	17.0
3/ 8	2130	26 54.08	69 34.28	7.2	319	22.3	59.3	0.115E-01	24.4	1021.9		2		30	0	290	14	16.8
3/ 8	2200	26 54.04	69 34.27	6.7	334	22.5	55.9	0.110E-01	24.3	1022.1		2	3	335	0	0	13	16.5
3/ 8	2230	26 56.62	69 37.96	6.1	336	22.2	66.1	0.128E-01	24.2	1022.1		2	3	305	13	15	24	17.6
3/ 8	2300	27 0.81	69 42.60	6.0	352	22.1	56.8	0.109E-01	24.0	1022.5				310	13	20	23	16.3
3/ 8	2330	27 5.31	69 47.44	5.1	356	21.6	59.2	0.111E-01	24.3	1022.9				310	13	20	21	16.2
3/ 9	0	27 7.85	69 50.37	6.2	349	21.7	65.5	0.123E-01	24.2	1023.3				260	0	90	12	17.1
3/ 9	30	27 7.74	69 50.14	6.2	4	22.1	65.9	0.127E-01	24.2	1023.6				265	0	100	12	17.5
3/ 9	100	27 7.83	69 50.15	7.3	12	21.7	64.7	0.121E-01	24.2	1023.9				330	1	40	15	17.0
3/ 9	130	27 11.35	69 53.59	11.2	12	21.3	83.2	0.153E-01	24.2	1023.7				310	13	40	30	18.9
3/ 9	200	27 16.22	69 58.55	9.9	28	21.1	76.2	0.138E-01	24.2	1023.9				315	13	45	26	17.9
3/ 9	230	27 21.87	70 4.44	10.3	22	20.9	76.9	0.138E-01	23.6	1024.5				310	13	45	27	17.8
3/ 9	300	27 22.58	70 5.46	9.8	35	20.2	72.8	0.126E-01	23.7	1025.0				30	1	5	20	16.7
3/ 9	330	27 22.94	70 5.45	10.9	23	19.3	79.9	0.131E-01	23.7	1025.0				65	1	320	22	16.7
3/ 9	400	27 22.78	70 5.55	9.8	14	20.2	76.2	0.131E-01	23.6	1025.2				295	0	80	19	17.1
3/ 9	430	27 22.66	70 2.15	11.3	13	20.2	75.4	0.130E-01	23.5	1025.2				90	13	310	28	17.0
3/ 9	500	27 22.43	69 54.49	11.8	14	20.2	75.4	0.130E-01	23.9	1025.2				90	13	310	29	17.0
3/ 9	530	27 22.30	69 46.90	10.2	20	20.0	72.6	0.124E-01	23.9	1025.2				85	13	320	28	16.5
3/ 9	600	27 22.36	69 39.41	8.8	24	19.8	74.2	0.125E-01	23.5	1025.2				85	13	325	26	16.5
3/ 9	630	27 22.51	69 33.87	8.8	4	20.0	72.6	0.124E-01	23.5	1025.2				5	0	0	17	16.5
3/ 9	700	27 22.40	69 33.56	8.2	14	19.7	68.9	0.116E-01	23.5	1025.2				350	0	25	16	15.8
3/ 9	730	27 22.45	69 33.85	9.3	6	19.6	71.4	0.119E-01	23.5	1025.2				345	1	20	19	16.0
3/ 9	800	27 23.04	69 34.21	9.5	18	19.5	72.1	0.120E-01	23.4	1025.2				355	10	15	28	16.0
3/ 9	830	27 29.04	69 33.87	9.0	13	19.2	76.2	0.124E-01	23.3	1025.2				355	14	10	31	16.2
3/ 9	900	27 35.56	69 34.17	8.6	20	19.0	67.3	0.108E-01	22.5	1025.2				355	12	15	28	15.0
3/ 9	930	27 41.96	69 34.58	9.1	20	18.6	72.1	0.113E-01	22.4	1026.1				355	13	15	30	15.2
3/ 9	1000	27 48.55	69 35.61	7.9	13	18.8	65.4	0.104E-01	22.5	1025.7				355	13	10	28	14.6
3/ 9	1030	27 55.05	69 36.37	8.4	12	18.5	70.2	0.110E-01	23.0	1025.7	4	2 02	6	355	13	10	29	14.9
3/ 9	1100	28 1.56	69 37.07	7.6	23	17.9	68.7	0.104E-01	22.5	1026.4	4	2 02	6	355	13	15	27	14.2
3/ 9	1130	28 8.28	69 38.47	6.6	37	17.9	66.1	0.998E-02	22.5	1027.0	4	2 02	6	355	14	20	25	13.9
3/ 9	1200	28 15.15	69 39.27	6.2	27	17.8	69.5	0.104E-01	22.4	1027.1	4	2 02	6	355	14	15	25	14.2
3/ 9	1230	28 20.95	69 39.76	6.1	49	17.8	64.2	0.964E-02	22.6	1027.5	4	2 02	6	355	14	25	23	13.6
3/ 9	1300	28 27.51	69 40.09	8.3	48	17.8	68.6	0.103E-01	22.5	1027.8	4	2 02	6	355	13	30	26	14.1
3/ 9	1330	28 33.71	69 40.36	6.0	37	18.1	61.1	0.934E-02	22.5	1028.1	4	2 02	6	355	13	20	23	13.5
3/ 9	1400	28 40.28	69 40.77	6.9	53	18.2	64.6	0.994E-02	22.5	1028.4	1	2 02	6	355	13	30	23	14.0
3/ 9	1430	23 46.62	69 40.58	7.3	80	18.4	57.3	0.891E-02	22.5	1028.3	1	3 02	6	355	13	45	20	13.3
3/ 9	1500	28 52.89	69 40.70	7.1	90	18.2	54.5	0.838E-02	22.3	1028.5	1	2 02	6	355	13	50	18	12.8
3/ 9	1530	28 58.75	69 40.64	4.7	74	18.2	60.4	0.928E-02	21.5	1028.4	1	2 02	6	355	14	30	18	13.5
3/ 9	1600	29 4.73	69 41.10	6.6	90	18.4	65.7	0.102E-01	21.7	1028.3	4	2 02	6	355	14	45	18	14.3
3/ 9	1630	29 10.77	69 41.24	8.4	60	18.2	62.9	0.967E-02	21.9	1028.5	1	3 03	6	350	13	40	24	13.8
3/ 9	1700	29 16.68	69 41.23	6.7	69	18.2	69.0	0.106E-01	21.7	1028.2	1	4 03	6	350	13	40	20	14.5
3/ 9	1730	29 23.16	69 41.67	6.6	60	17.8	62.5	0.938E-02	20.4	1027.0	1	4 03	6	350	13	35	21	13.4
3/ 9	1800	29 29.64	69 42.18	6.2	68	18.0	61.0	0.926E-02	20.5	1028.0	16	4 03	5	355	13	35	20	13.4
3/ 9	1830	29 36.10	69 43.03	7.0	58	17.6	64.8	0.962E-02	20.5	1028.0	15	3 03	5	350	13	35	22	13.5
3/ 9	1900	29 42.47	69 43.94	4.8	63	17.2	63.4	0.920E-02	20.6	1027.8	15	3 03	4	350	13	30	18	13.0
3/ 9	1930	29 48.95	69 44.89	4.5	73	17.2	58.2	0.844E-02	20.5	1028.0	15	3 01	3	355	13	30	17	12.4
3/ 9	2000	29 55.52	69 46.02	5.6	84	16.8	55.9	0.792E-02	20.6	1027.5	13	2 00	3	355	13	40	17	11.8
3/ 9	2030	30 3.50	69 47.34	4.1	78	16.8	57.6	0.816E-02	20.3	1028.0	14	2 00	3	355	13	30	16	12.0
3/ 9	2100	30 9.67	69 47.69	4.5	73	16.6	59.1	0.827E-02	20.4	1028.0	14	2 00	3	355	13	30	17	12.0
3/ 9	2130	30 14.97	69 48.04	3.0	64	16.3	59.6	0.819E-02	20.3	1028.0	15	2 00	3	355	13	20	16	11.8
3/ 9	2200	30 21.76	69 48.43	3.7	99	16.7	56.6	0.797E-02	20.3	1027.5	2 2	1 01	3	355	14	30	14	11.8

VI. OCEANUS Phase Two CTD Stations

Raymond Pollard, IOS completed six CTD stations in the vicinity of the central mooring array during FASINEX Phase Two. A complete summary of the work including times, positions, plots and listings are presented in FASINEX Technical Report #11, SeaSoar CTD Surveys during FASINEX in Appendix A.

Reference IOS Technical Report: Pollard, R.T., Read, J.F. & Smithers, J. 1986 SeaSoar CTD Surveys during FASINEX. Institute of Oceanographic Sciences, Report, No. 230, 111pp.

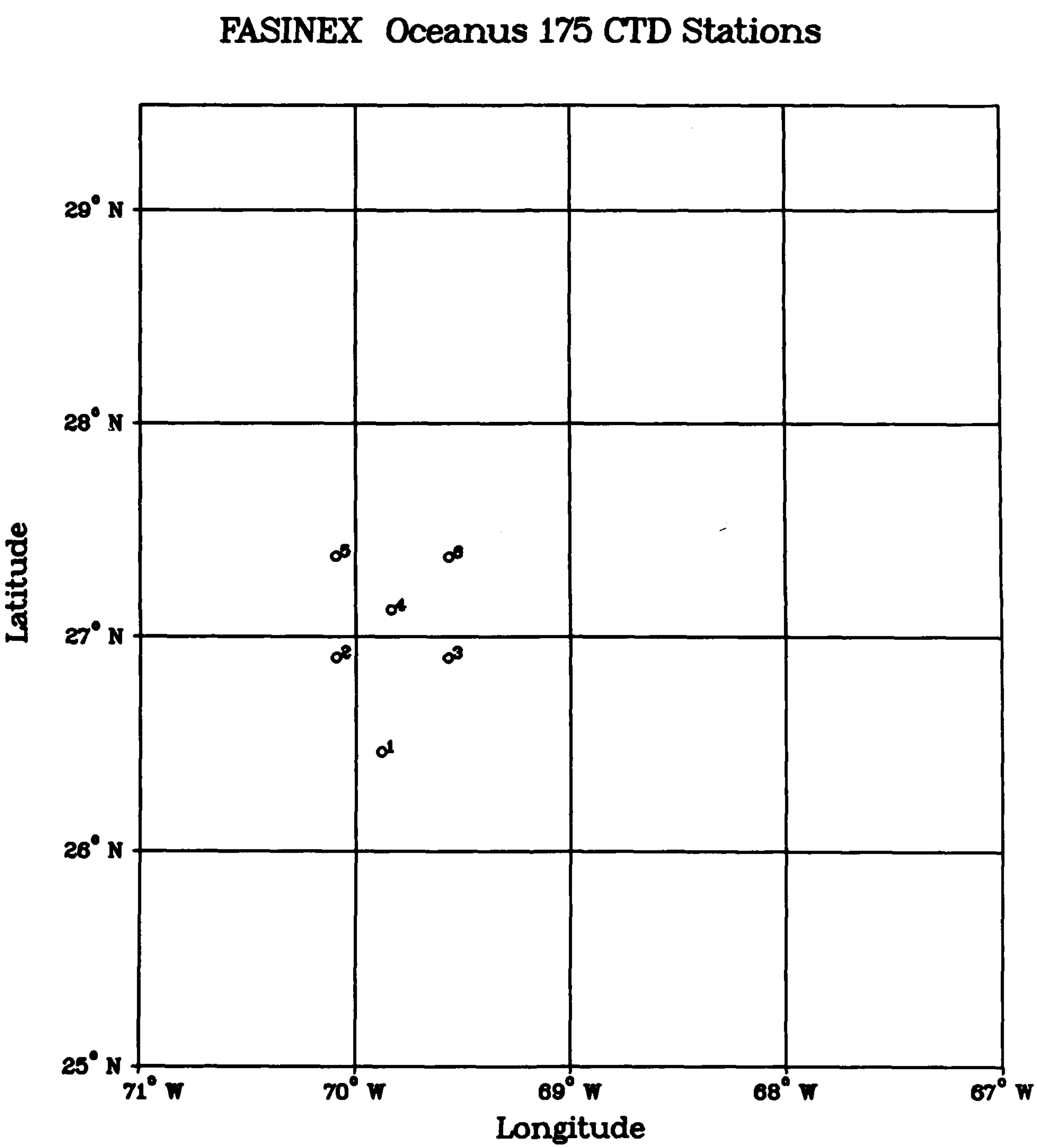


Figure VI-1: CTD Station Locations.

FASINEX CTD STATIONS - OCEANUS 175

Station	(GMT) Time	1986	INTERNAV Positions Latitude	Longitude	Comments
1	1400	8 March	26 27.81	69 52.86	South of Central Array
2	1702	8 March	26 54.18	70 05.44	Lower southwest corner of mooring box
3	2043	8 March	26 54.07	69 34.21	F8
4	2345	8 March	27 07.62	69 50.13	Midway between F6 & F4
5	0408	9 March	27 22.76	70 05.44	F2
6	0628	9 March	27 22.51	69 33.87	F10

Table VI-1: CTD Station Information.

VII. Vertical Current Meter (VCM) Data

VCMs are neutrally buoyant, free-floating instruments which are ballasted to sink to a predetermined depth. While floating at that depth the instrument makes measurements of the vertical velocity relative to itself, of pressure, and of temperature.

Relative vertical current is sensed by an array of vanes mounted axially around the float. Because the float compressibility is less than that of water, vertical motions in the water generate relative vertical flow past the vanes causing the entire float to rotate. This rotation is sensed relative to an internal compass. The sum of the pressure change (float vertical motion) and the rotation of the float (flow relative to the float) is a measure of total vertical water displacement, with a resolution of about 2 cm.

The VCM includes an AMF acoustic release receiver and a release of WHOI design. On command from the ship, or on preset command from an internal timer, the float drops a 900 gm weight and returns to the surface for recovery. A flashing light turns on at release time, and the "ping" rate doubles to confirm release.

Two VCM experiments were carried out during Phase Two on OCEANUS. The first dual experiment had a VCM ballasted to 140m and one ballasted to 90m. This is a 60 hour data set. The second deployment included three VCMs ballasted to 150, 95, and 175 m. This is a 48 hour data set.

Lloyd Regier's surface and 50 m drogued drifters were deployed and tracked at approximately the same time as the VCM work.

Some preliminary data are presented.

Figure VII-1	Schematic of VCM
Figure VII-2	Area 1 Drift Tracks
Figure VII-3	Expanded Scale Drift Tracks of VCM 2 and 4
Figure VII-4	Expanded Scale Drift Tracks of VCM 2, 4 and 5
Table VII-1	VCM Drift Information
Figure VII-5	Displacement Plots for VCM 2 and 4 - Deployment 1
Figure VII-6	Displacement Plots for VCM 2, 4 and 5 - Deployment 2

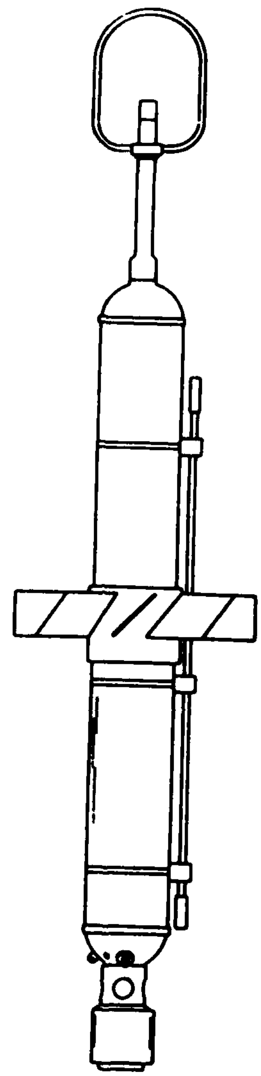


Figure VII-1: Schematic of VCM.

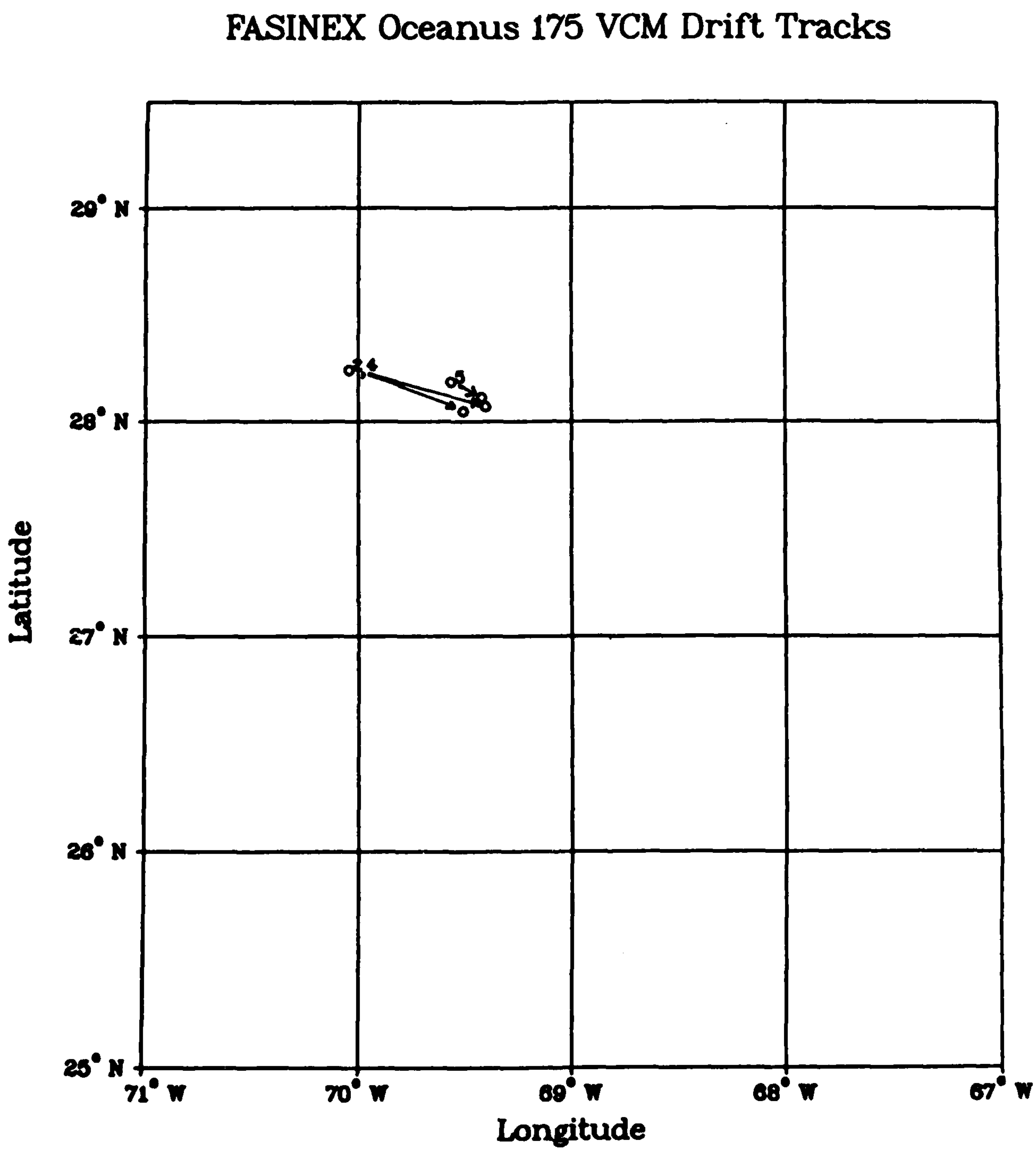


Figure VII-2: Area 1 Drift Tracks.

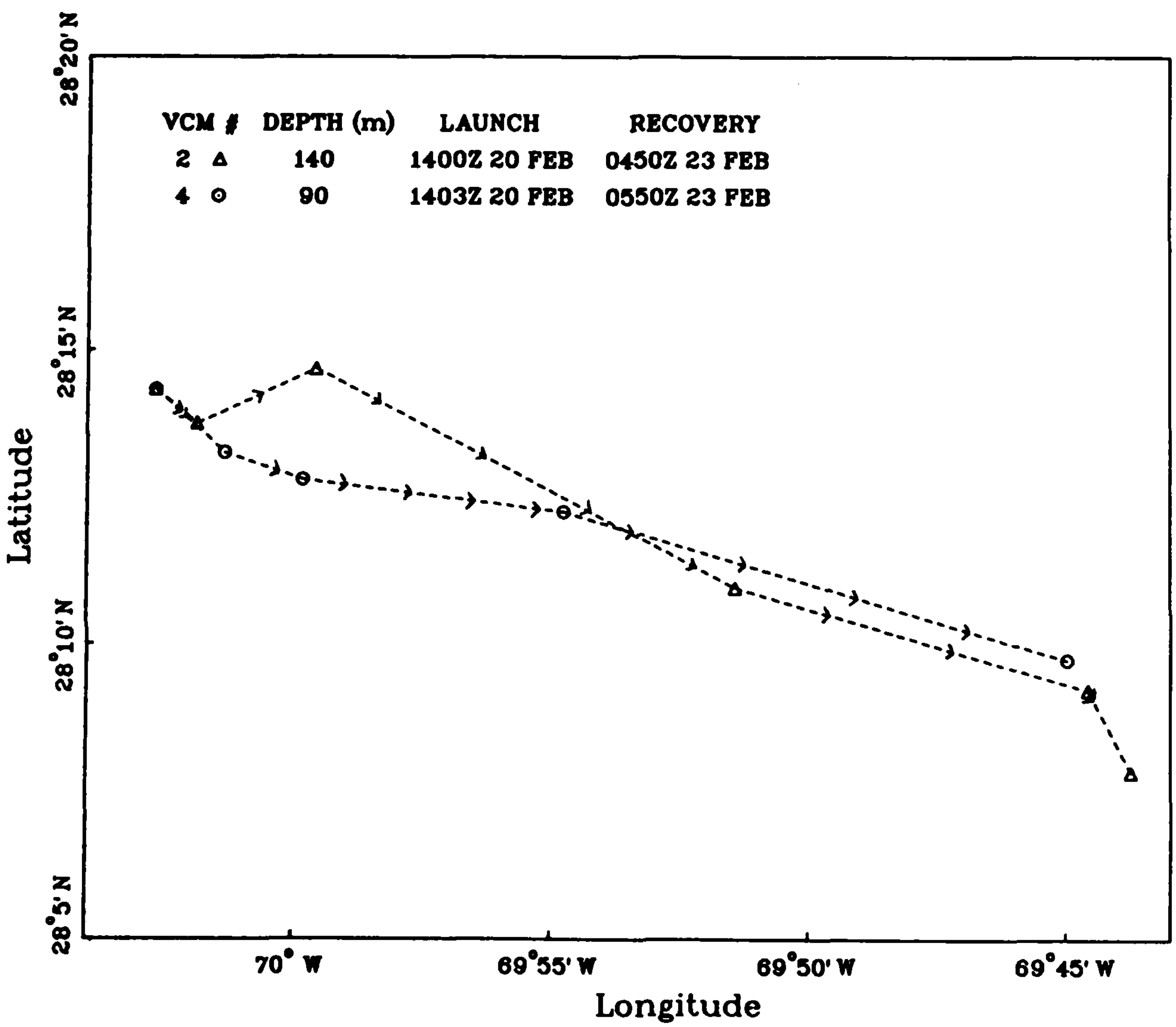


Figure VII-3: Expanded Scale Drift Tracks of VCM 2 and 4.

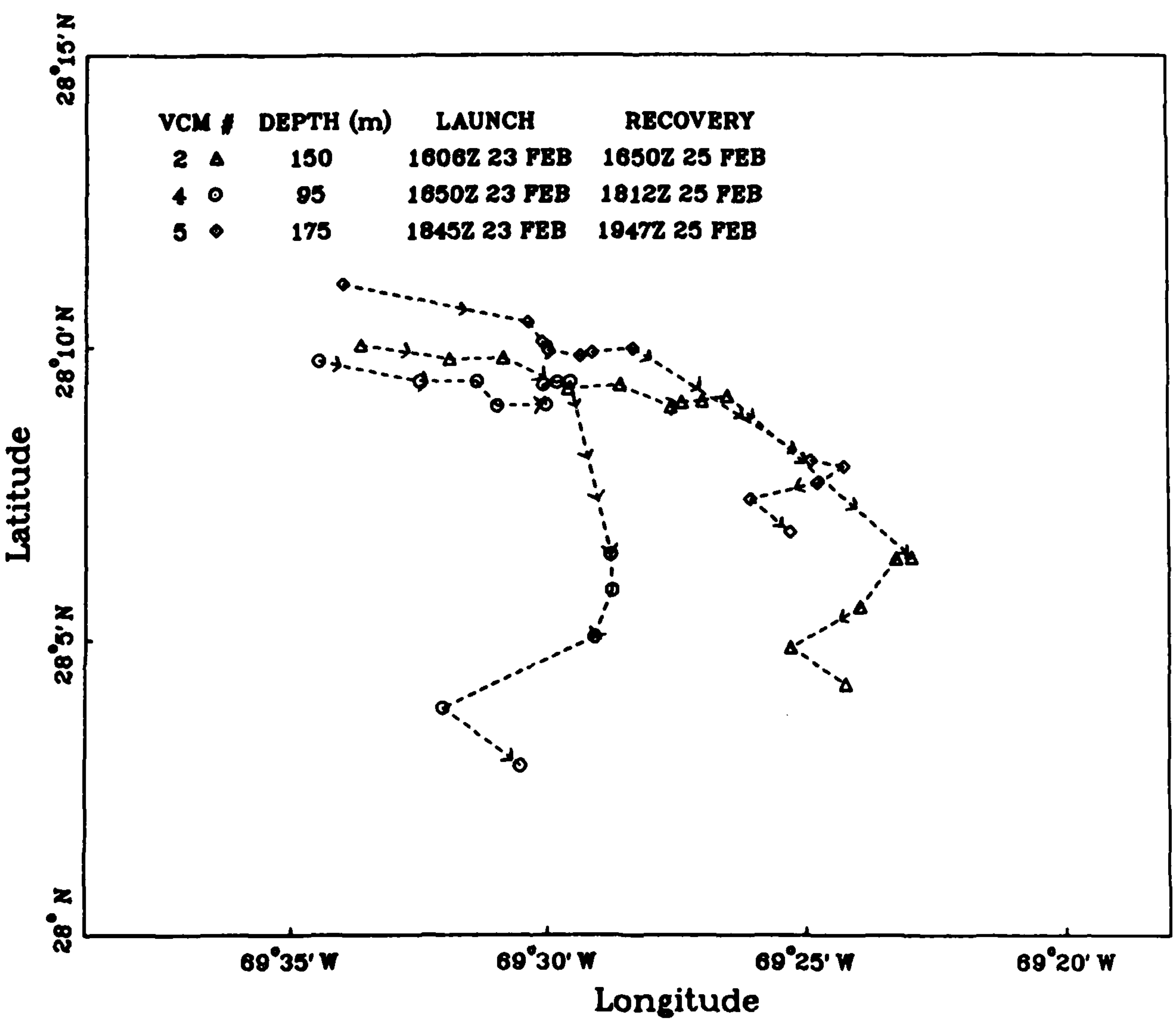


Figure VII-4: Expanded Scale Drift Track of VCM 2, 4 and 5.

OC175

VCM Drop #	Nominal Depth	Data Hours	Start Time (Z)	End Time (Z)	Comment	Deployment Latitude	Position Longitude	Retrieval Latitude	Position Longitude
1	140 m	56.8	20 Feb 86 1400	23 Feb 86 0450	VCM #2	28°14.33'	70°02.68'	28°07.83'	69°43.76'
2	90 m	57.78	20 Feb 86 1403	23 Feb 86 0550	VCM #4	28°14.33'	70°02.68'	28°09.73'	69°44.98'
3	150 m	42.7	23 Feb 86 1606	25 Feb 86 1649	VCM #2	28°10.04'	69°33.67'	28°04.25'	69°24.23'
4	95 m	43.4	23 Feb 86 1650	25 Feb 86 1812	VCM #4	28°09.77'	69°34.49'	28°02.87'	69°30.53'
5	175 m	44.95	23 Feb 86 1650	25 Feb 86 1947	VCM #5	28°11.08'	69°34.02'	28°06.84'	69°25.31'

Table VII-1: VCM Drift Information.

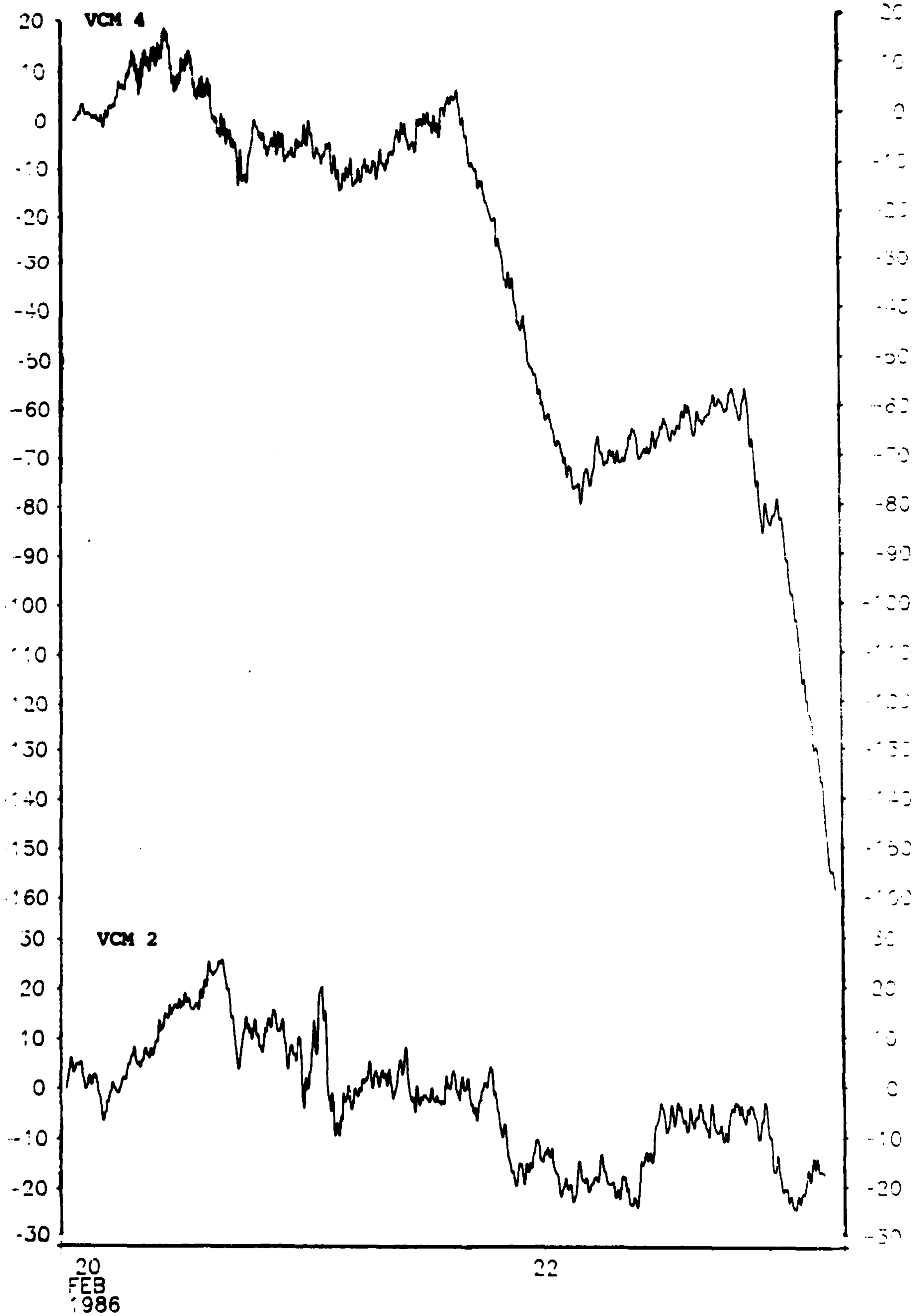


Figure VII-5. Displacement Plots of VCM 2 and 4.

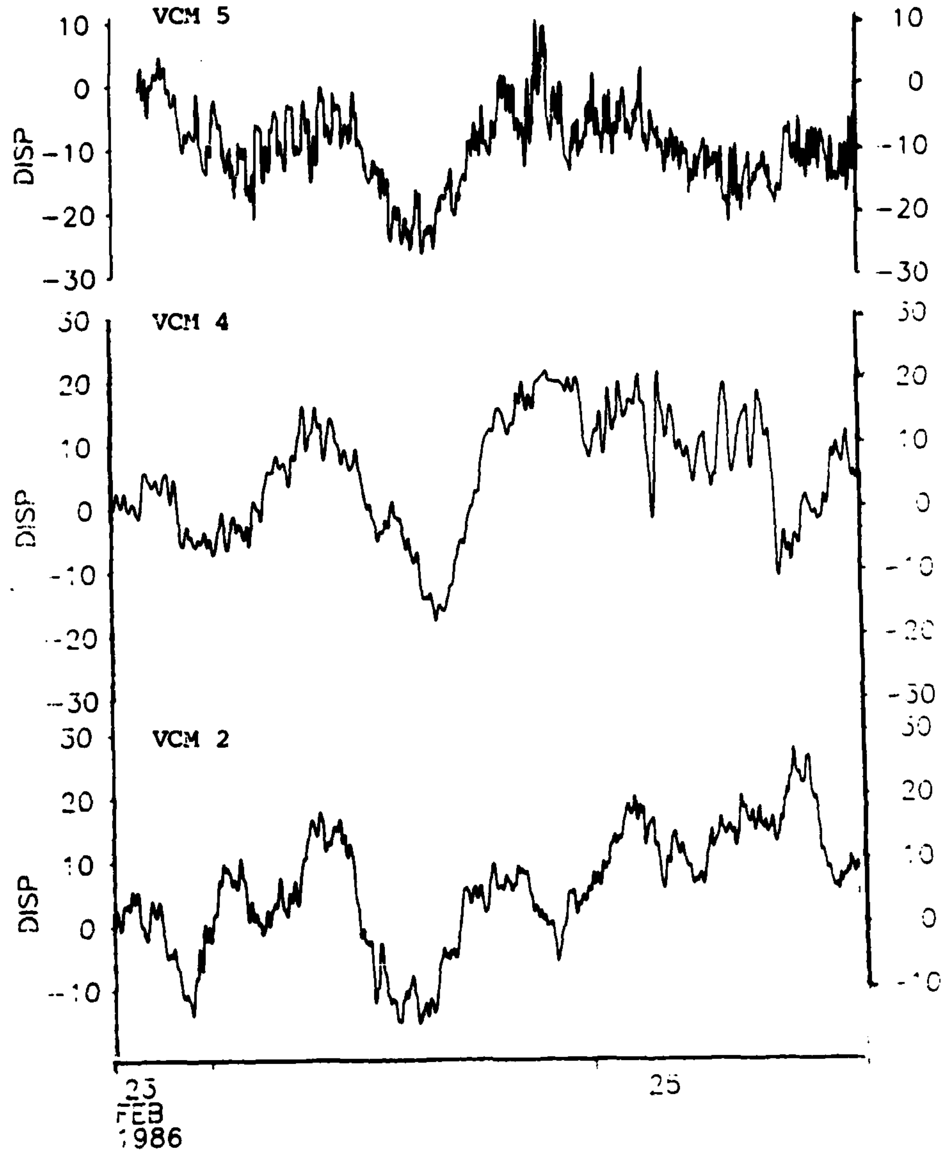


Figure VII-6. Displacement Plots of VCMs 2, 4, and 5.

VIII. Real Time Profiler Data

The RTP directly measures vertical velocities as well as horizontal velocities, temperature, and conductivity. Two velocity sensors, consisting of two cosine-response propellor assemblies are mounted at right angles on the RTP with the axis of rotation of one propeller assembly on each sensor oriented vertically. A fin attached to the pressure case that houses the electronics orients the instrument with respect to the mean flow so that the velocity sensors are upstream of the pressure housing. Two vertically oriented propeller assemolies produce redundant vertical velocity measurements. The two horizontally oriented propeller assemblies measure orthogonal components of velocity, which, together with the heading from the compass in the instrument, can be transformed into the east and north components of horizontal velocity. In addition, the instrument is fitted with an external temperature sensor, a conductivity sensor, a pressure sensor, and two accelerometers that sensed tilt. All other data from the RTP are both recorded internally and transmitted in digital format up the cable every 14 seconds.

An RTP section was completed across a front during Phase Two. The stations consisted of a profile to approximately 300m. Stations one to three were part of an aborted section. Stations four to 17 worked across the front from warm to cold on March 4-5.

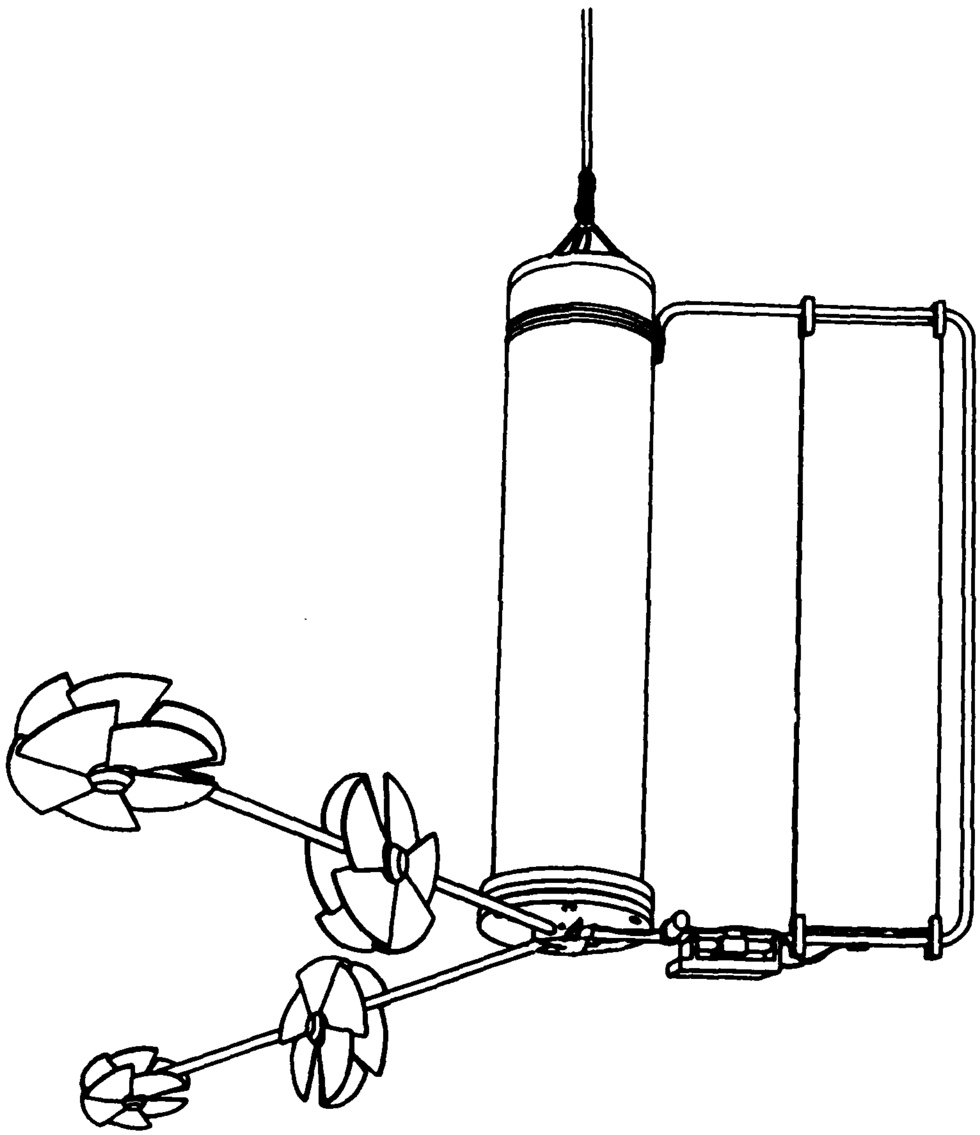


Figure VIII-1: Schematic of RTP.

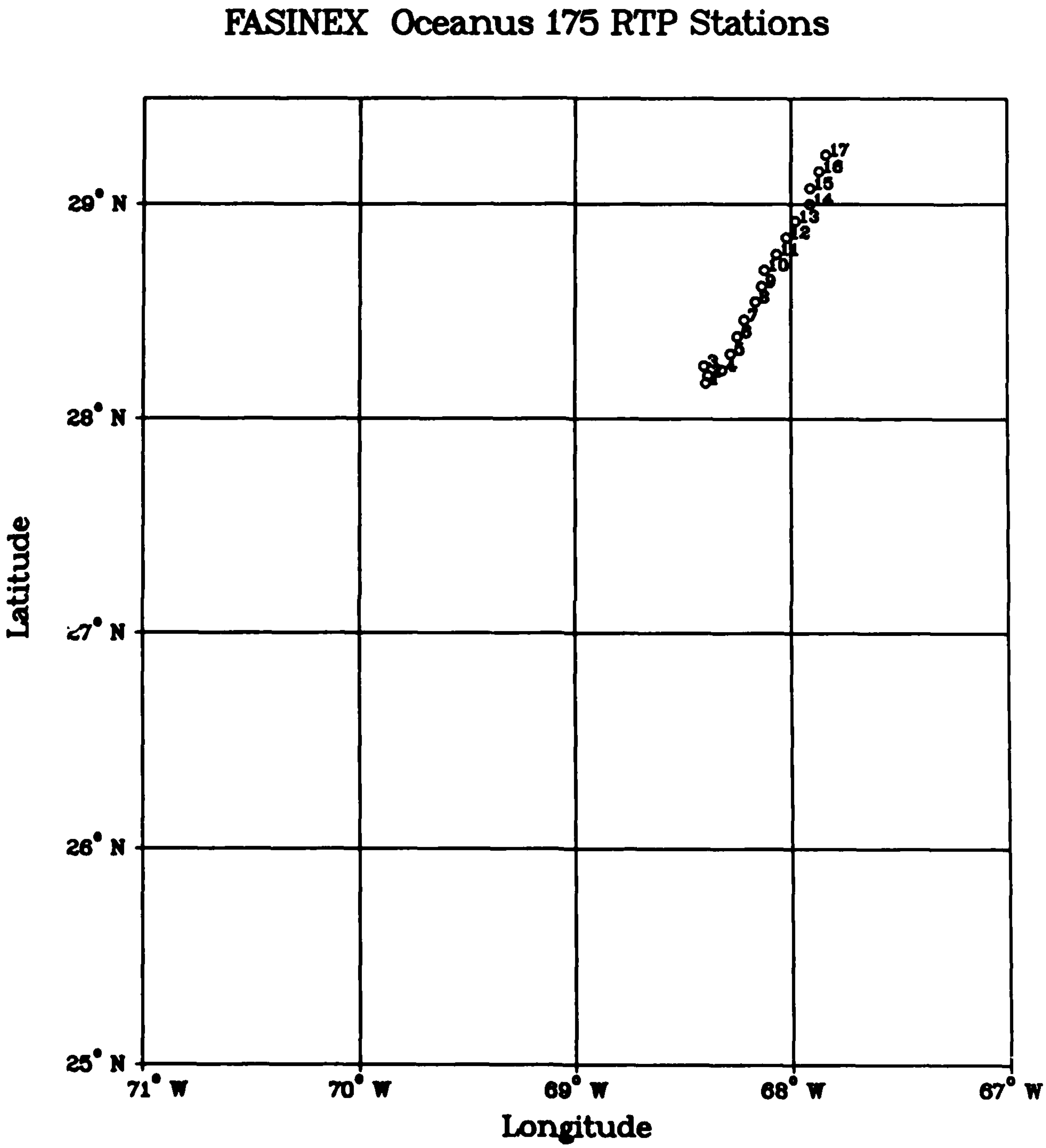


Figure VIII-2: RTP Station Positions.

OCEANUS 175 Real Time Profiler (RTP)

Station No.	Start Time (Z)	End Time (Z)	Deployment Position Latitude	Deployment Position Longitude	Retrieval Position Latitude	Retrieval Position Longitude	Drop Nos.	Max Depth (m)
1	1106 1 Mar	1242 1 Mar	28°10.06'	68°23.57'	28°12.02'	68°23.09'	1	275
2	1308 1 Mar	1436 1 Mar	28°12.09'	68°23.06'	28°12.16'	68°22.79'	1	295
3	1525 1 Mar	1626 1 Mar	28°14.75'	68°24.18'	28°14.52'	68°23.42'	1	173
4	1439 4 Mar	1607 4 Mar	28°13.64'	68°19.22'	28°13.78'	68°17.59'	1 2	300 20
5	1643 4 Mar	1803 4 Mar	28°18.17'	68°16.80'	28°18.40'	68°15.60'	1	300
6	1842 4 Mar	1958 4 Mar	28°23.02'	68°14.85'	28°23.60'	68°13.73'	1	300
7	2034 4 Mar	2143 4 Mar	28°27.61'	68°12.90'	28°28.51'	68°11.99'	1	300
8	2233 4 Mar	2348 4 Mar	28°32.67'	68°09.92'	28°33.37'	68°08.22'	1	300
9	0022 5 Mar	0207 5 Mar	28°37.00'	68°08.15'	28°36.55'	68°06.57'	1	300
10	0205 5 Mar	0417 5 Mar	28°41.52'	68°07.33'	28°41.59'	68°06.49'	1	300
11	0503 5 Mar	0602 5 Mar	28°45.94'	68°03.97'	28°46.27'	68°03.93'	1	300
12	0659 5 Mar	0815 5 Mar	28°50.66'	68°01.17'	28°50.56'	68°00.27'	1	300
13	0920 5 Mar	1055 5 Mar	28°55.22'	67°58.82'	28°54.18'	67°55.28'	1	300
14	1149 5 Mar	1316 5 Mar	29°00.06'	67°54.74'	28°59.05'	67°54.78'	1	293
15	1539 5 Mar	1638 5 Mar	29°04.58'	67°54.64'	29°04.09'	67°53.49'	1	250
16	1726 5 Mar	1839 5 Mar	29°09.34'	67°52.10'	29°08.68'	67°51.53'	1	300
17	1926 5 Mar	2047 5 Mar	29°14.08'	67°50.29'	29°13.71'	67°50.44'	1	300

Table VIII-1: RTP Station Information.

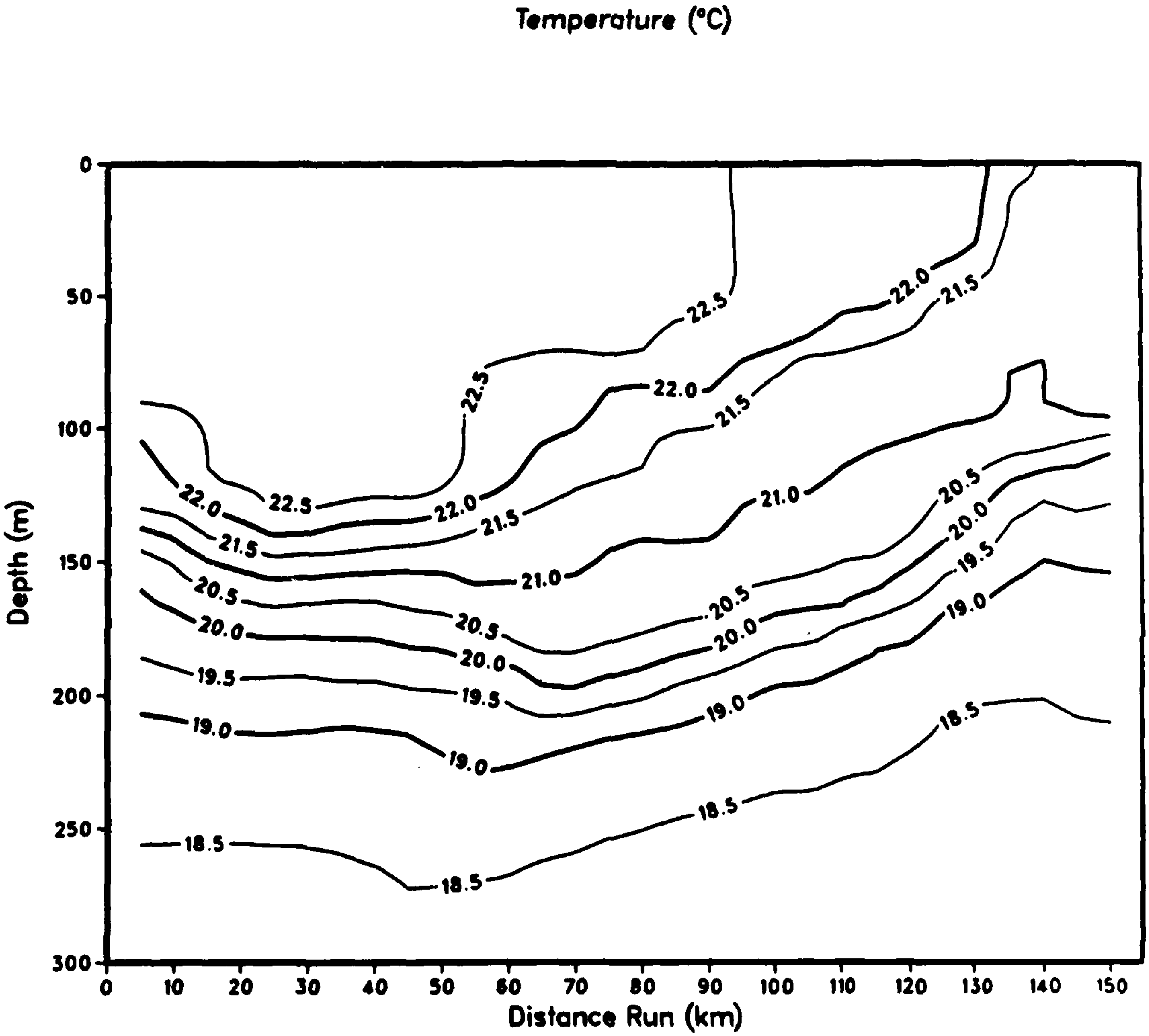


Figure VIII-3: RTP Temperature Sections.

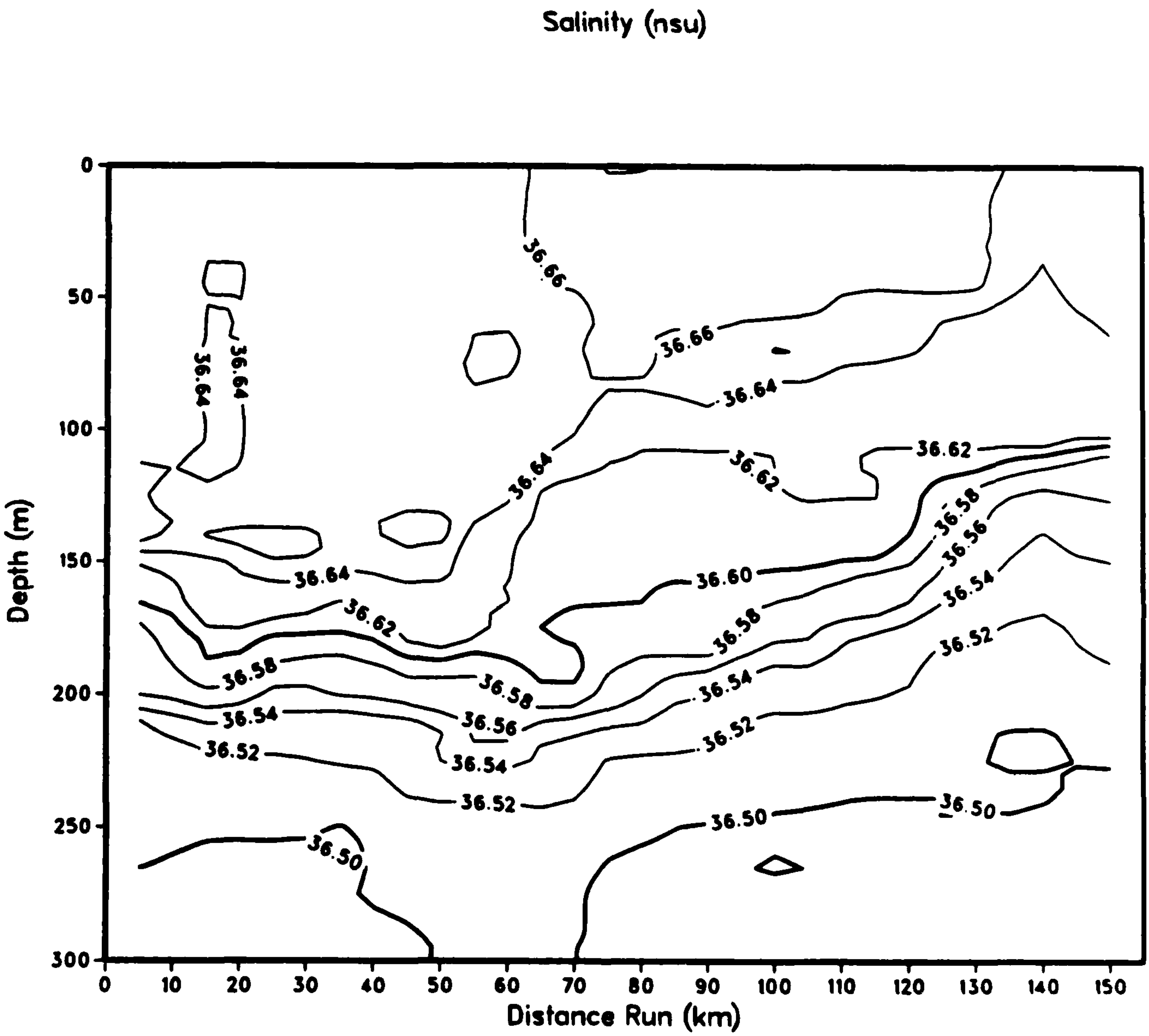


Figure VIII-4: RTP Salinity Section.

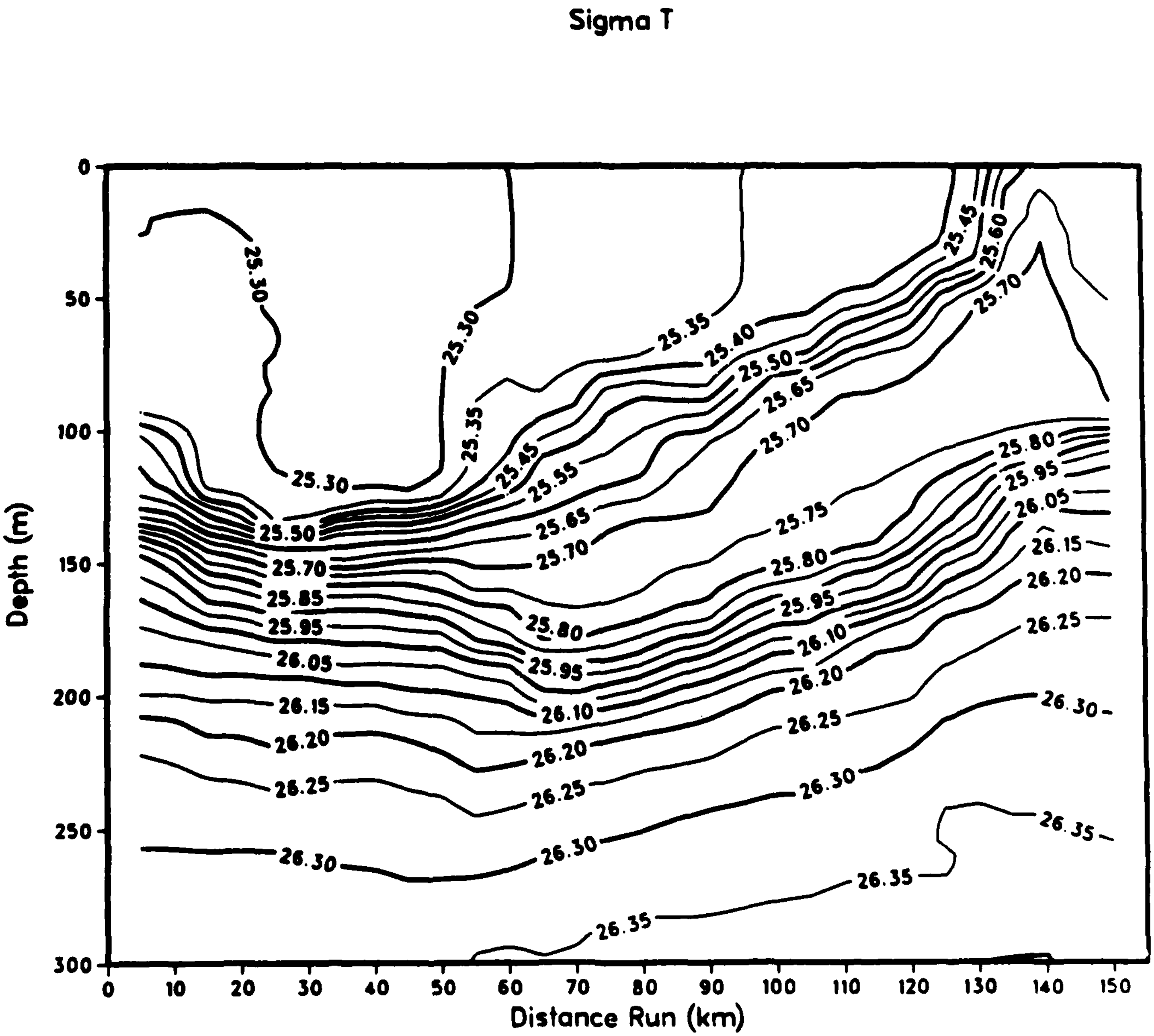


Figure VIII-5: RTP Sigma T Section.

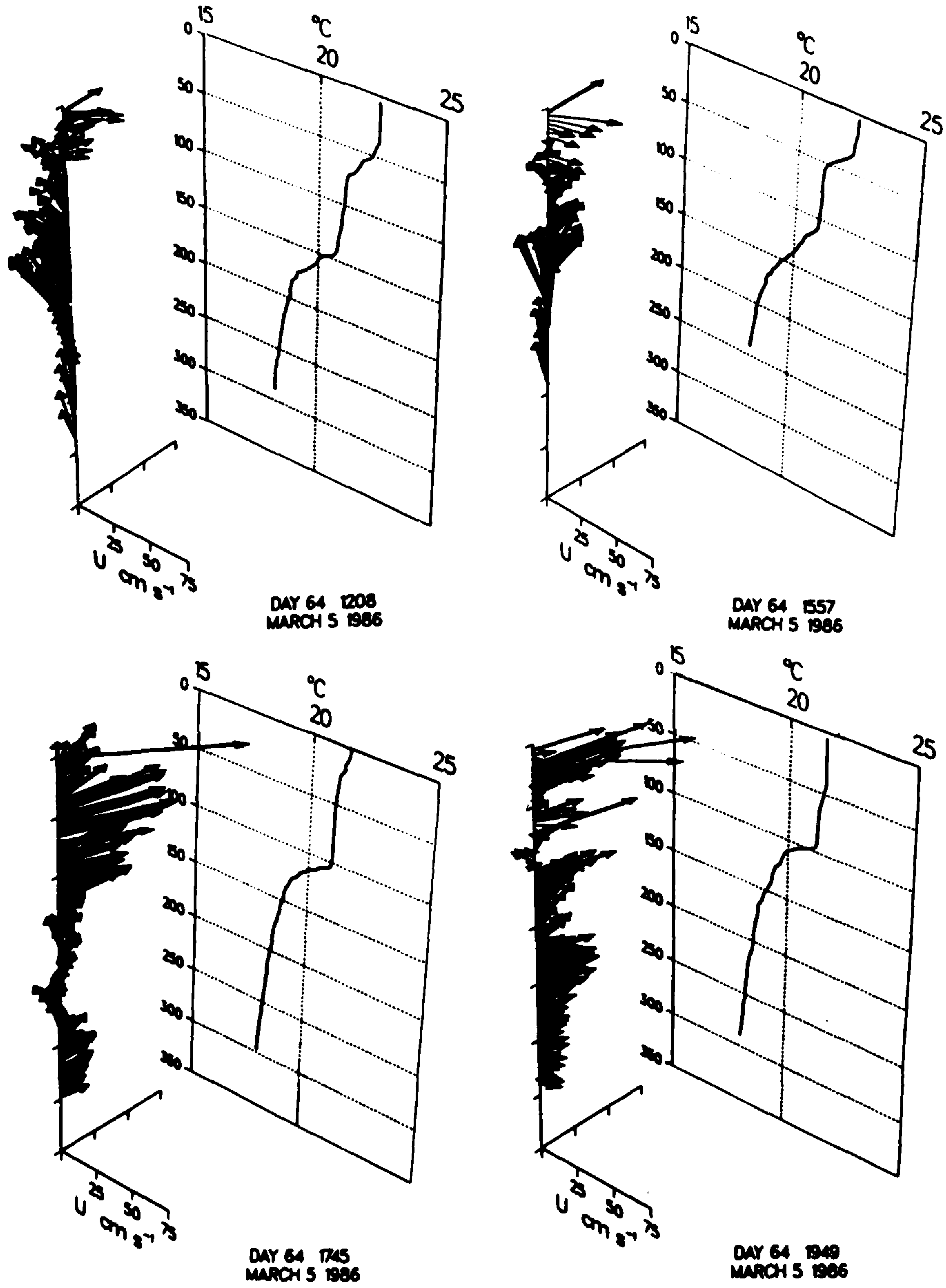


Figure VIII-6: 3-D Velocity Sticks from Warm and Cold Side of Front.

IX. SeaSoar

Towed SeaSoar sections in FASINEX

The Institute of Oceanographic Science's SeaSoar, with faired cable, shallow Neil Brown Instrument Systems CTD instruments, and full NERC shipboard computing facilities was used on R.V. OCEANUS during FASINEX Phase Two. With CTD casts to over 350m at 1 to 2 Km intervals while underway at 8-9 knots, close spaced CTD sections were obtained along and across fronts. The data were calibrated, corrected, plotted and contoured on board ship to provide smoothed (reduced internal wave noise) sections with a few km resolution of temperature, salinity, density and hence pressure gradients and geostrophic velocity shear, within hours of data collection. Temperature/salinity diagrams were used to identify water masses, origins and mixing rates.

SeaSoar specification and capabilities

The SeaSoar (Figure IX-1) is a modified version of the Canadian Batfish (Dessurealt, 1976), enlarged to carry a Neil Brown Instrument Systems CTD. The adjustable wings are hydraulically powered by a propellor at the back of the vehicle. A ship speed greater than 5 knots is needed to develop full power. At lower speeds, wing response is sluggish and depth control consequently poor. A speed of 8-9 knots is optimal. Ten knots is possible, but increasing cable tensions reduce the maximum depth and cycling rate.

In automatic mode, the deck unit generates a sawtooth pressure signal (with operator set minimum and maximum depths, rate of ascent and rate of descent). A servo-control compares the CTD pressure signal with the sawtooth function and adjusts the wing angle to match the two. Deviations from a straight line during ascent or descent are generally less than 2 dbar.

Maximum ascent and descent angles are about 1:5 (much greater than frontal slopes of order 1:50 or less). With 600 m of Fathom faired cable, a maximum depth of over 360 m is attainable, giving a horizontal distance between minimum depths of about 3 Km, i.e. a profile (up or down) on average every 1.5 Km. These separations can be reduced by reducing the depth range.

Shipboard data analysis allows profiles and contoured sections to be produced within 3 to 6 hours of data collection.

A data report summarizing the SeaSoar participation is available. It is FASINEX Technical Report #11, SeaSoar CTD Surveys during FASINEX .

Reference IOS Technical Report: Pollard, R.T., Read, J.F. & Smithers, J. 1986
SeaSoar CTD Surveys during FASINEX.
Institute of Oceanographic Sciences,
Report, No. 230, 111pp.

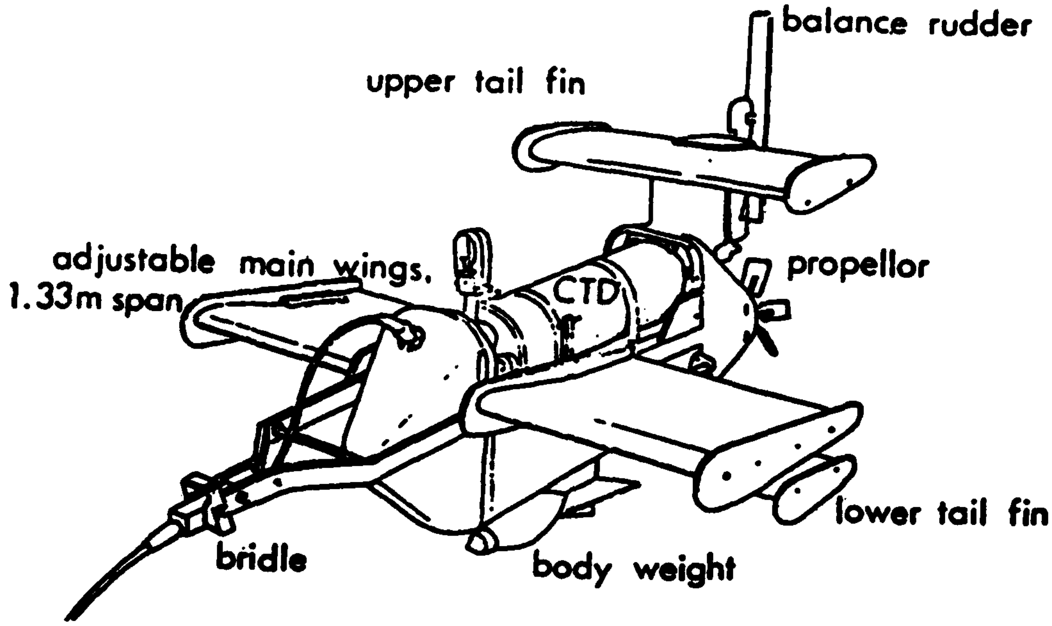


Figure IX-1: SeaSoar Schematic.

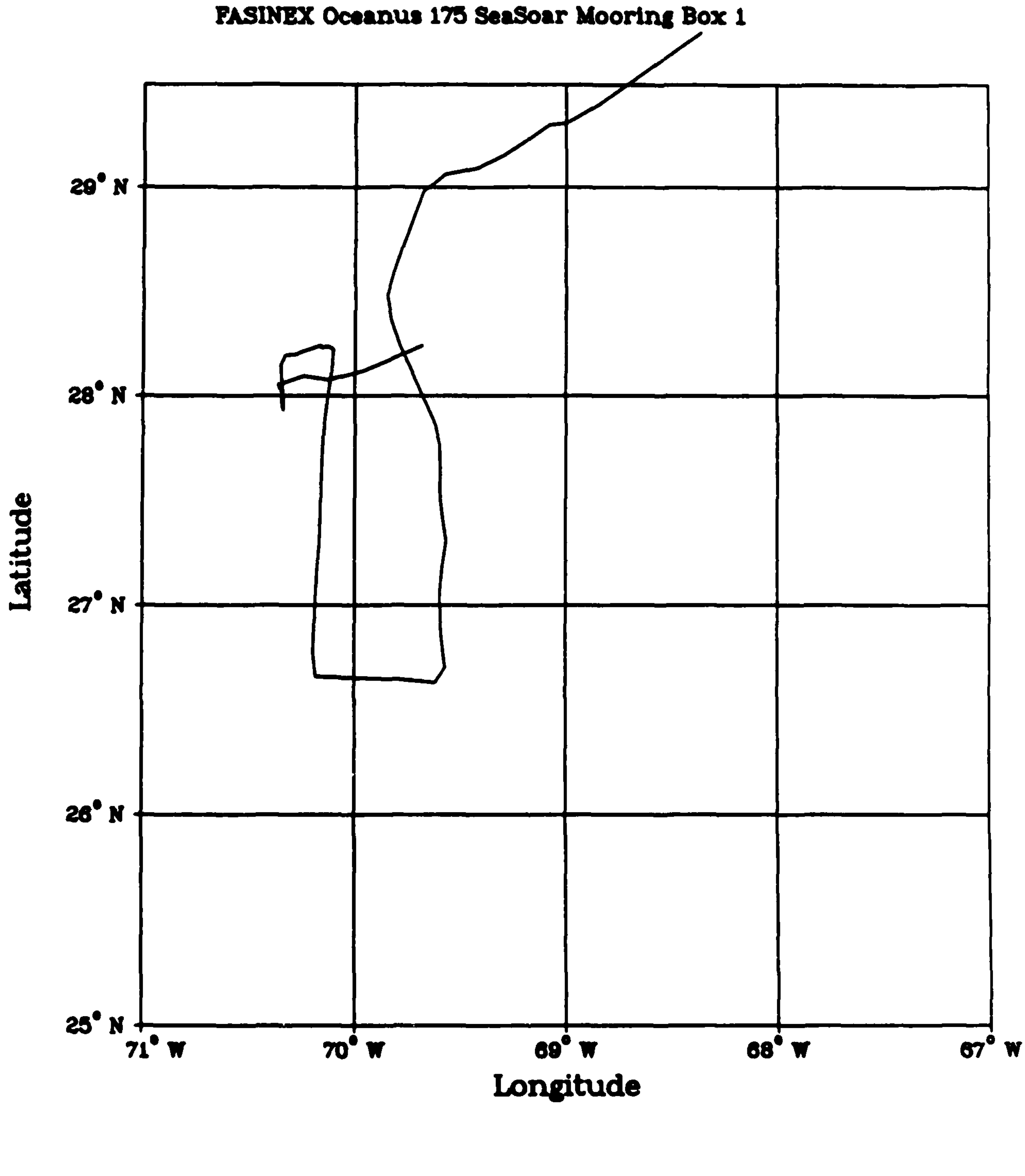


Figure IX-2: SeaSoar Mooring Survey #1 February 13-18.

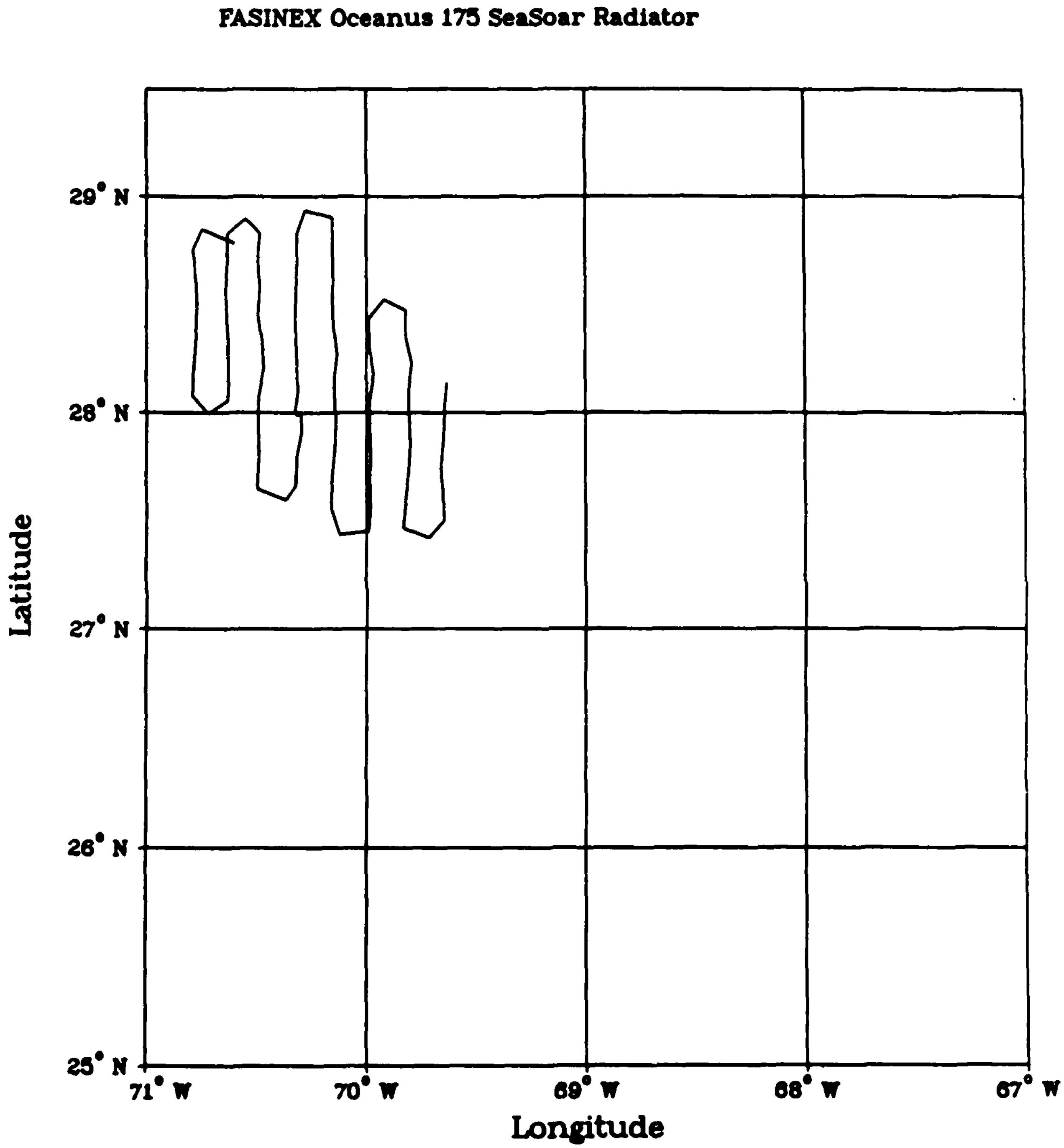
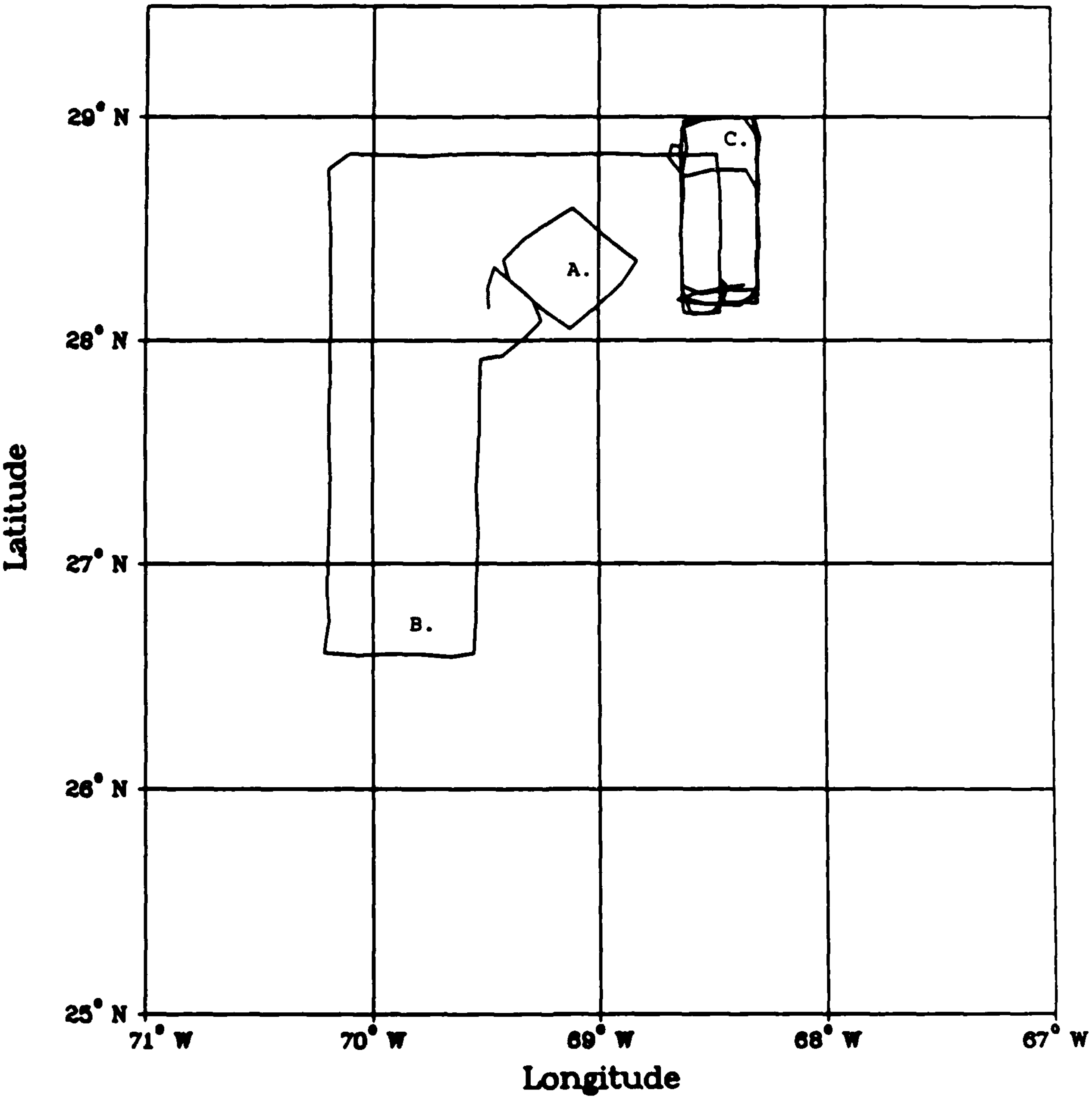


Figure IX-3: SeaSoar Radiator Pattern February 18-20.

FASINEX Oceanus 175 SeaSoar Boxes



A. Aborted Pattern due to rough seas
B. Mooring Box 2
C. Boxing in front found March 2-3

Figure IX-4: SeaSoar Box Patterns February 25-March 4.

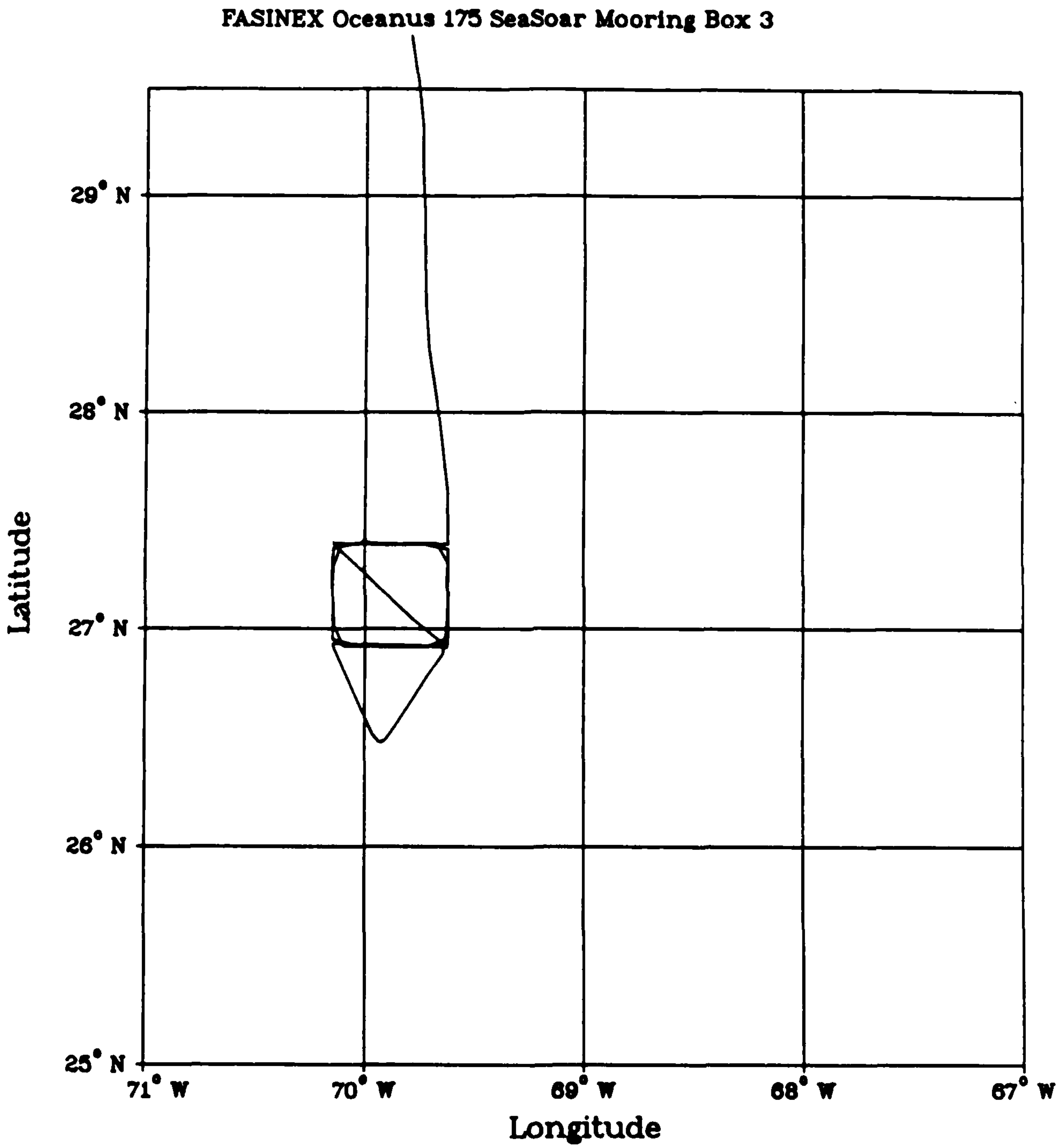


Figure IX-5: SeaSoar Mooring Survey #3 March 6-8.

Participant Summary:

X. Doppler Acoustic Current Profiles
Lloyd Regier

The Doppler current profiler on OCEANUS operated nearly continuously throughout FASINEX. Reliable data returns were obtained from 20 meters depth to about 200 meters throughout the experiment. Due to equipment failures and operator errors there are several time gaps in the data.

14 Feb 1257Z
04 Mar 0033
05 Mar 0222
0559
1119
06 Mar 1959
2058
11 Mar 1145

We have yet to edit the LORAN-C fixes and are thus unable to compute the current profiles relative to the earth. A crude estimate of the ship velocity relative to the earth may be obtained from a vertical average of the profiles of water velocity relative to the ship. Plots of currents relative to this average will have the same vertical structure as that of currents measured relative to the earth but will not accurately reveal the horizontal structure of the currents. The horizontal shears of currents can only be obtained from the true currents relative to the earth.

The contour map shows the behavior versus depth and along-track distance of the North and East components of current in cm/sec relative to the vertical averaged discussed above. The plot covers 400 kilometers of ship track and shows currents from 20 to 200 meters depth. The along-track distance is in kilometers traveled through the water; the ship odometer is reset to zero at each of the data gaps shown above. The vertical lines show the along-track ship position at each hour; each line is labeled with the day-of-year and GMT time. Also shown are the ship's heading and water temperature at 5 meters depth as functions of along-track distances.

Figure X-1	Total Ships Track of OC 175 = Doppler Data
Figure X-2	Doppler Section Feb 16 1300 - Feb 17 1800
Figure X-3	Position of 400 Kilometer Section

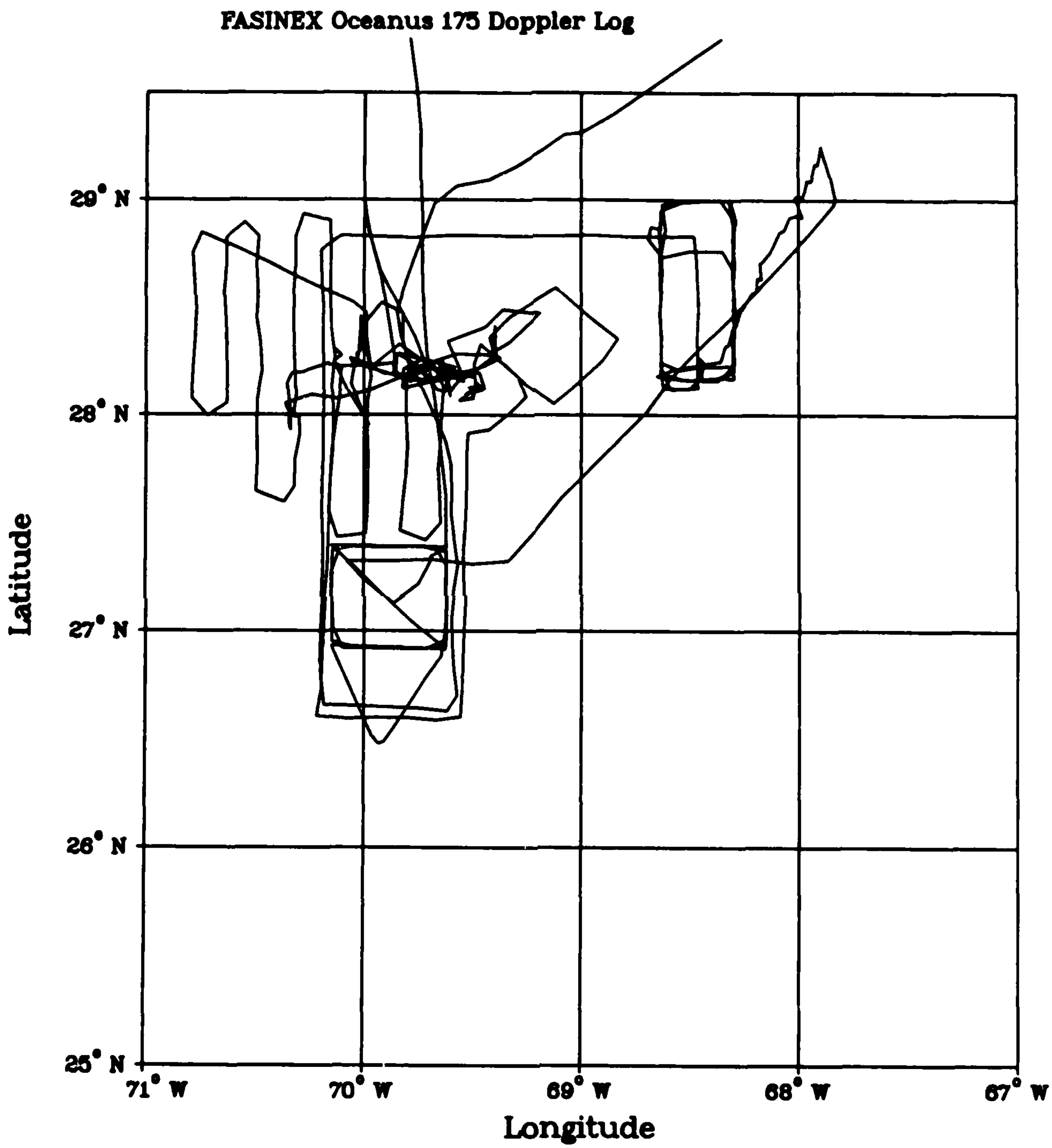


Figure X-1: Total Ships Track of OC 175 - Doppler Data.

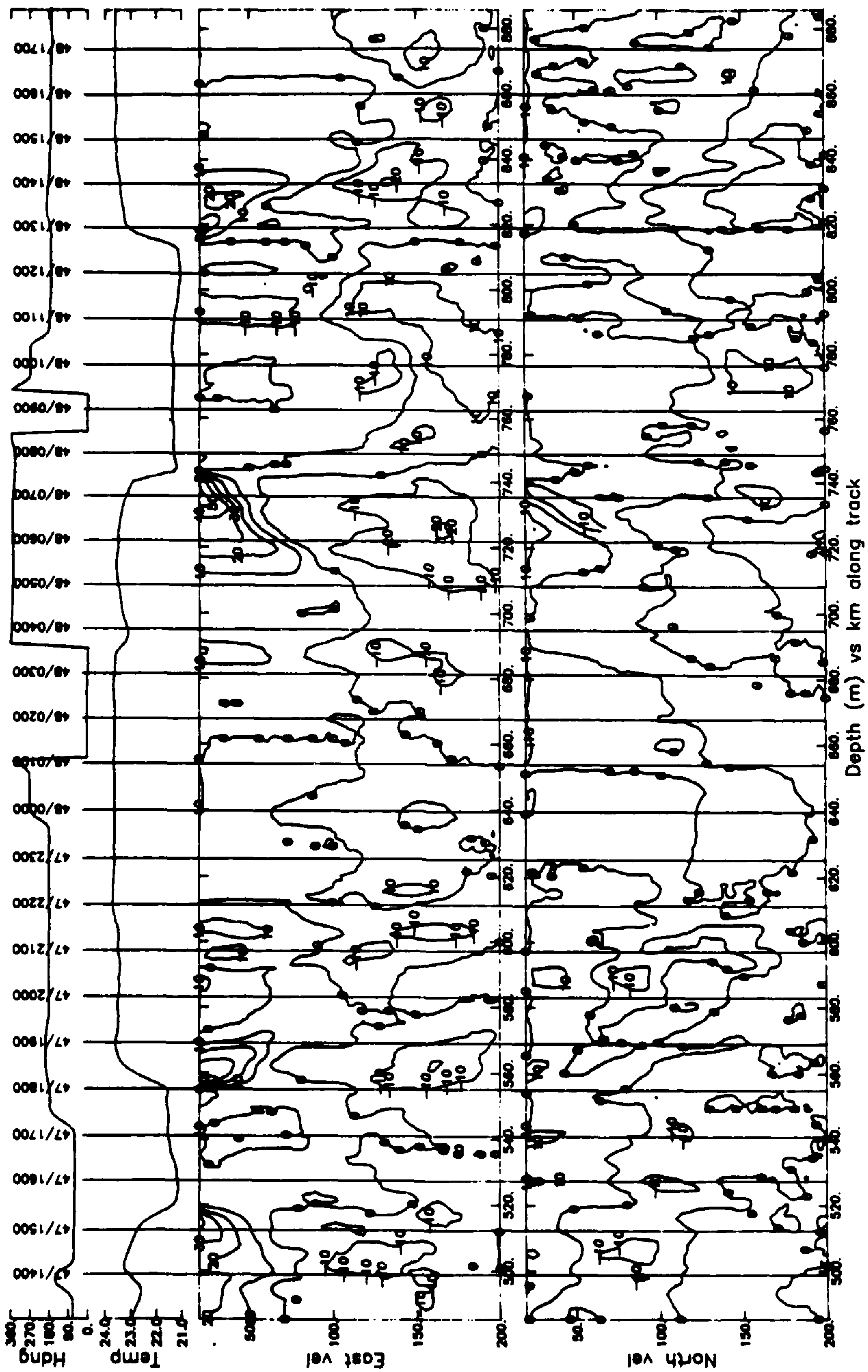


Figure X-2. Doppler Section February 16 1300 - February 17 1800.

FASINEX Oceanus 175 Doppler Section

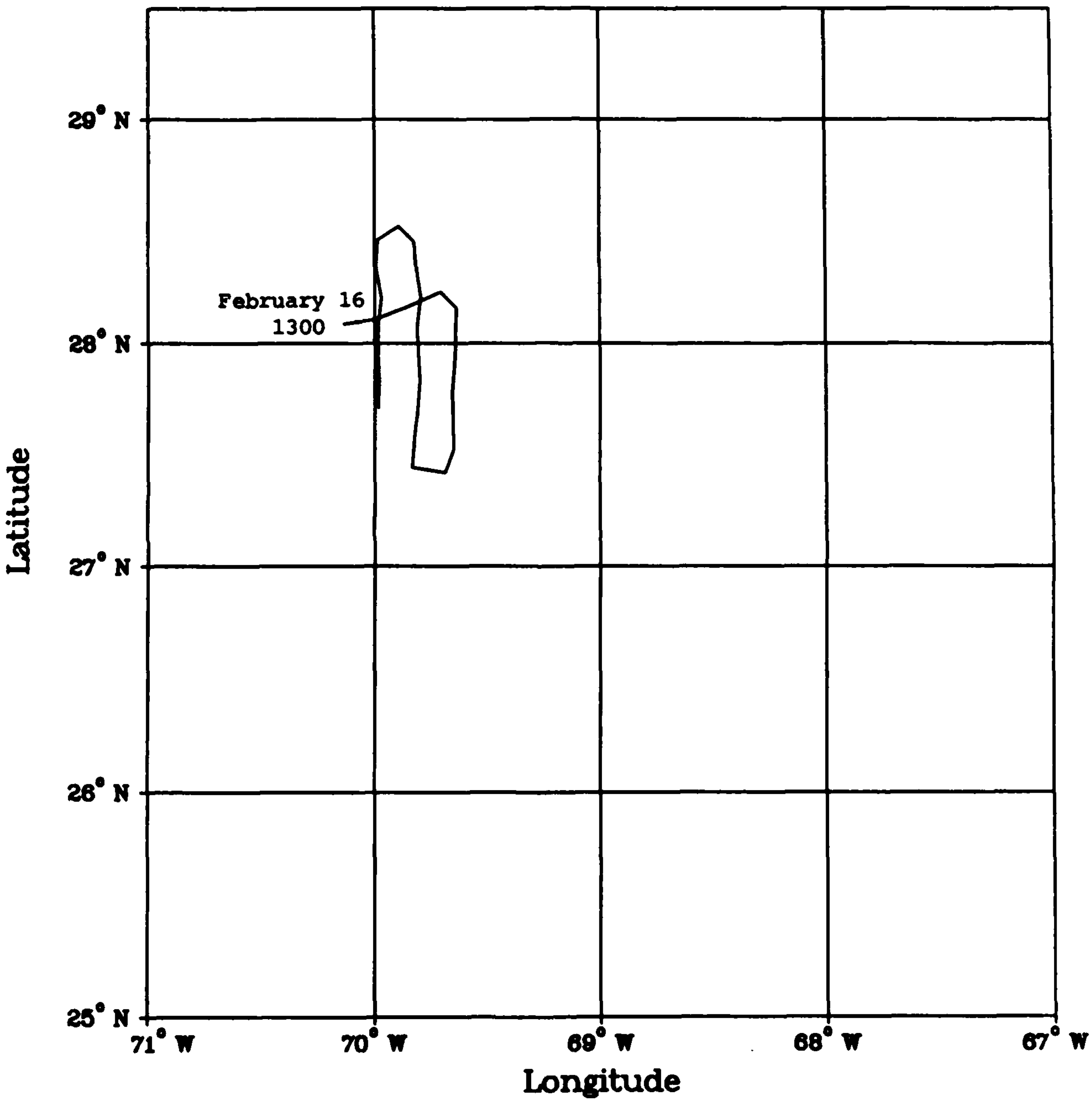


Figure X-3: Position of 400 Kilometer Section.

Participant Summary:

XI. Lagrangian Drifters Deployed from R. V. OCEANUS
Lloyd Regier and Russ Davis

Radio-tracked drifters were deployed from OCEANUS in three groups. Each group consisted of eight drifters, four drogued at 1 meter depth and four at 50 meters. The buoys were deployed in pairs, one deep and one shallow, with two pairs on either side of the front. Each buoy measured water temperature at a depth of 1 meter. The accompanying figures show the observed trajectories of those buoys which were trackable. Arrows show the direction of motion away from the deployment position. "D" denotes a 50 meter drogue and "S" denotes a 1 meter surface drifter. The year-day and GMT time of launch and final positions are shown on the trajectory plots. The reduction of the temperature data is ongoing.

Figure XI-1	SIO Drifter Deployments on Expanded scale chart
Figure XI-2	SIO Drifter Deployment #1
Figure XI-3	SIO Drifter Deployment #2
Figure XI-4	SIO Drifter Deployment #3

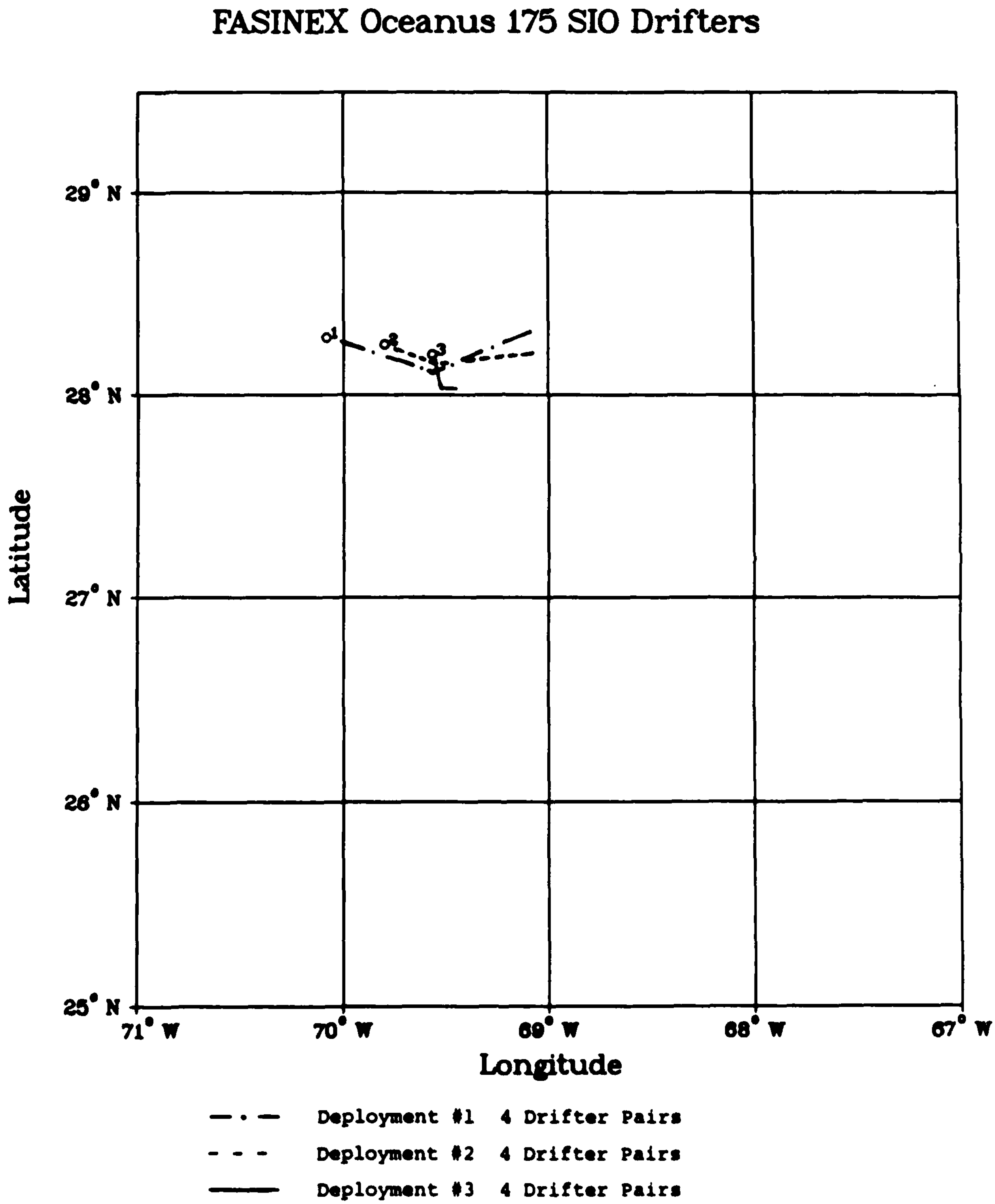


Figure XI-1: SIO Drifter Deployments on Expanded Scale Chart.

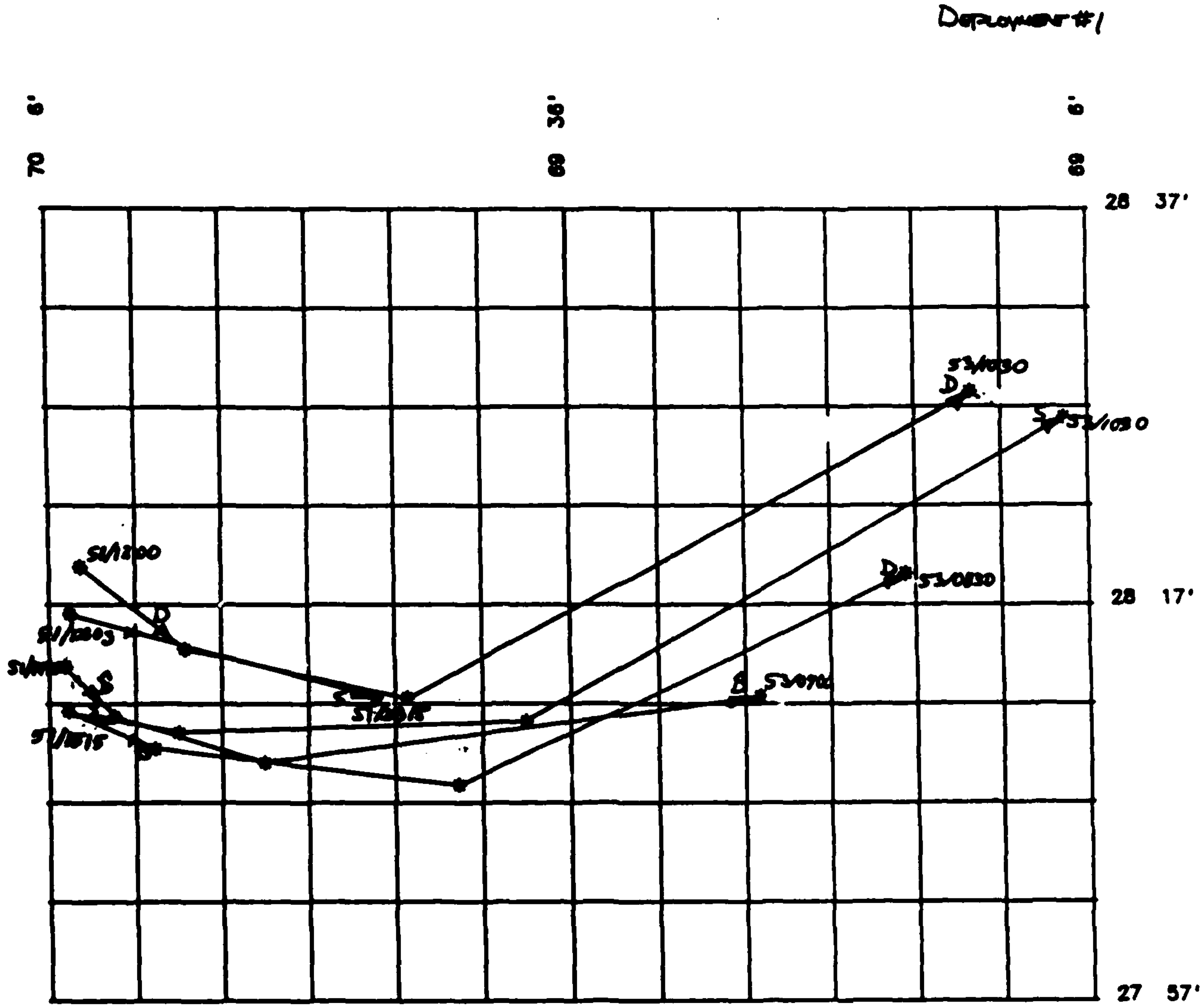


Figure XI-2. SIO Drifter Deployment #1.

DEPLOYMENT #2

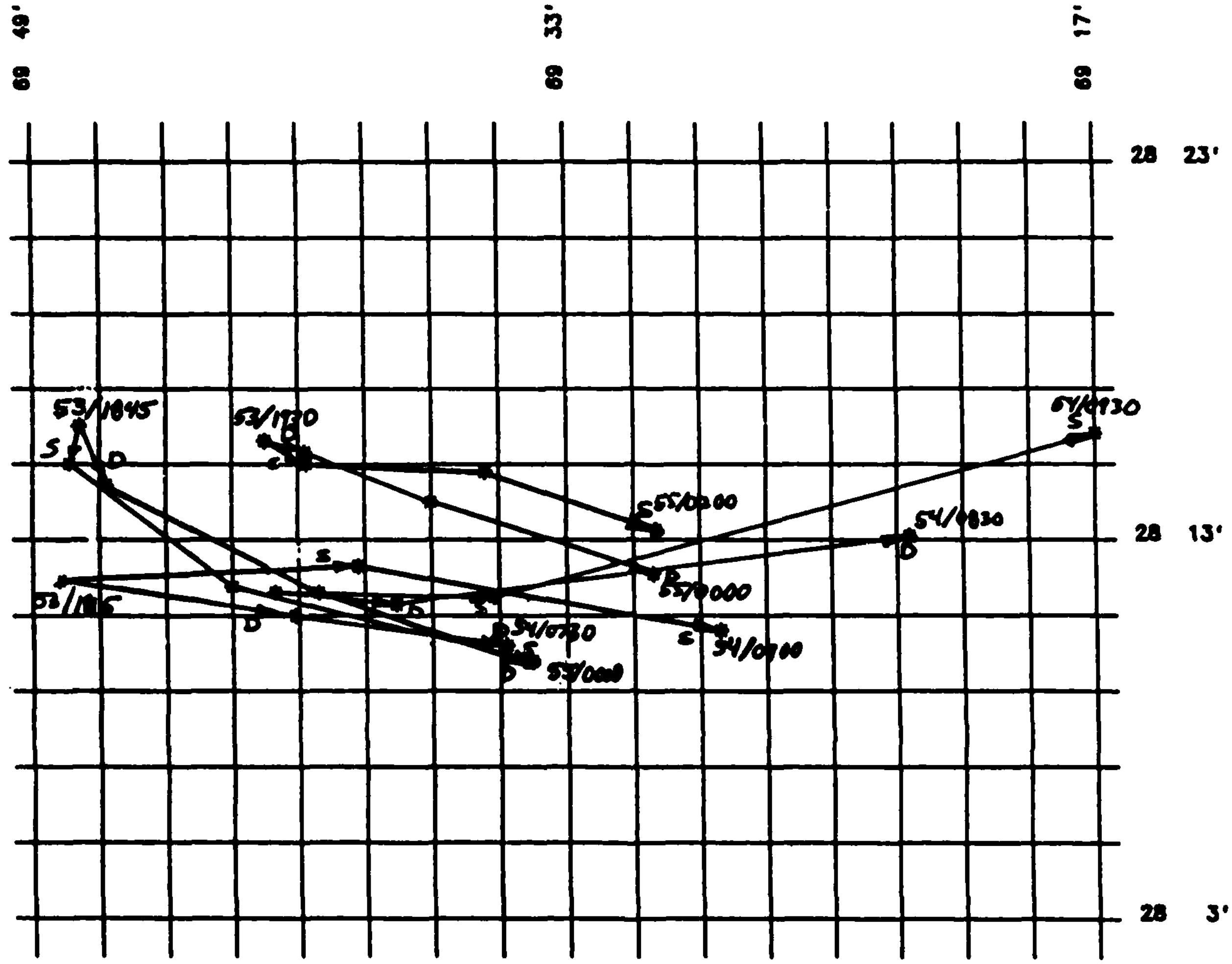


Figure XI-3. SIO Drifter Deployment #2.

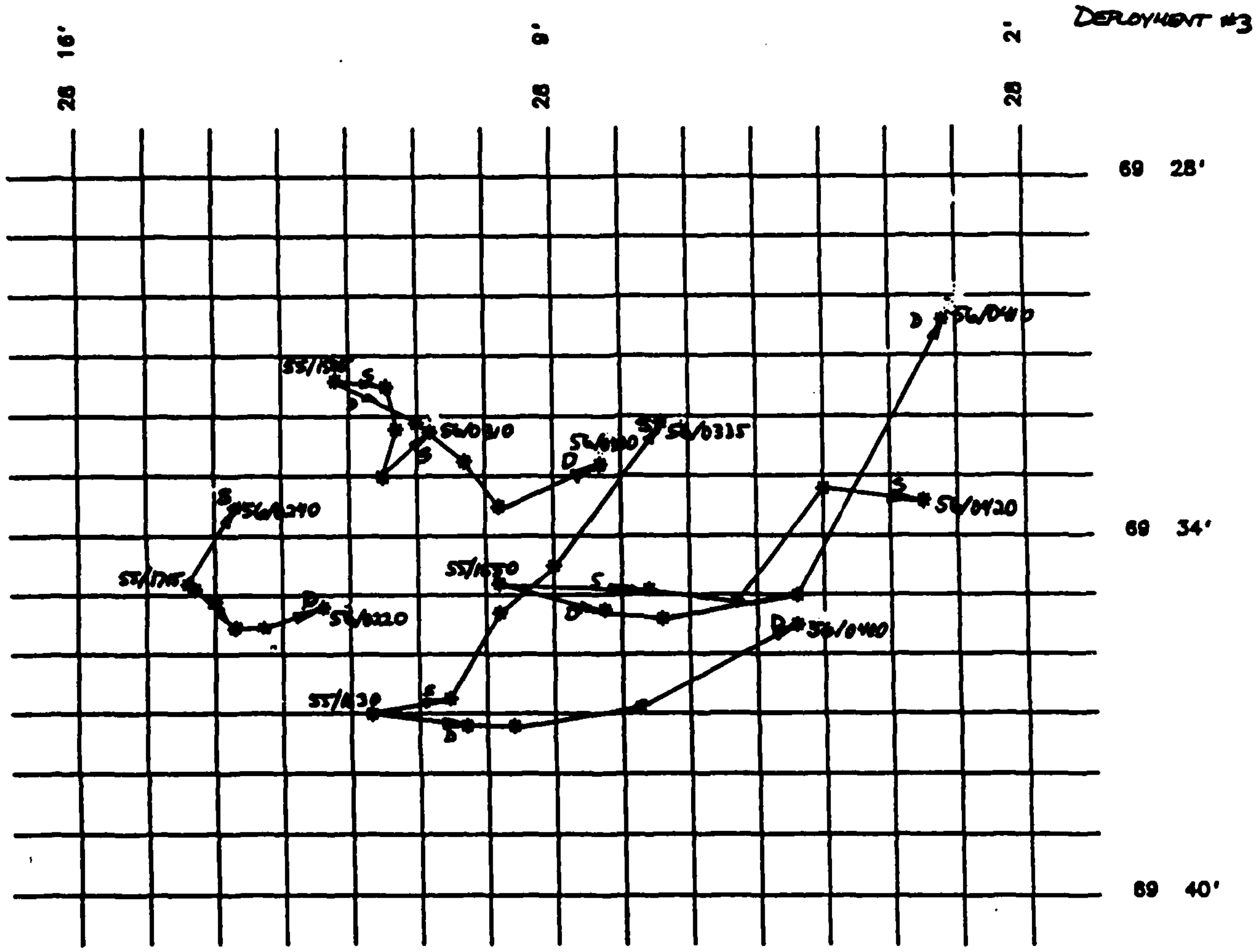


Figure XI-4. SIO Drifter Deployment #3.

Participant Summary:

XII. Shipboard Marine Radar Estimates of Wind Stress and Momentum Flux during FASINEX
Dennis B. Trizna

OBJECTIVES:

The objectives of our FASINEX participation are: (1) to better understand the scattering mechanisms responsible for low grazing angle sea scatter statistics by comparison with high quality in-situ measurements of wind stress and momentum flux; (2) to determine the effects on the marine radar sea scatter due to the sea surface temperature change associated with the thermal front, in concert with similar measurements made by the airborne active and passive remote sensors; (3) to develop empirical relationships between radar sea scatter statistics and the individual contributions to momentum flux which have been hypothesized based upon previous preliminary experiments.

In the FASINEX experiment, we are utilizing the marine radars on board the participating ships, the KNORR and the OCEANUS, for the measurement of low grazing angle sea scatter. Based upon previous measurements made aboard NOAA ships, a correlation was shown to exist between parameters of the cumulative distribution function of the normalized sea surface radar cross section (NRCS) and wind and wave conditions. This type of measurement appears to distinguish between sources of scatter due to small scale surface features generated by the wind, such as capillary waves, and more robust surface features generated by wave-wave interactions, such as breaking waves.

PRELIMINARY RESULTS:

Although some hardware difficulties were encountered on board the KNORR during the second leg of deployment of the buoy array, a sizable amount of X- and S-band radar data was successfully deployed aboard the OCEANUS and X-band data were collected for the entire cruise, resulting in 648 hourly files of data. In addition, photographs of the sea surface were taken by the met watch during daylight hours, from which white-cap coverage will be extracted. Professor Edward Monohan, University of Connecticut, has been contracted to analyze these data under internal NRL 6.1 core funds which recently came available.

First-pass processing of radar data statistics has been accomplished, producing azimuthal angle distributions of mean radar sea echo power levels. An example of such an azimuthal distribution is shown in Figure XII-1. A wide variety of angular widths of the mean echo distribution was observed, presumably associated with variation in the directional ocean wave spectrum angular spread.

Time histories of peak mean radar echo and direction from consecutive hourly angular distributions were also determined, as a preliminary catalogue of the data. Temporal variation of the echo with time, assumed to be

associated with wind speed variation, is quite dramatic, with a response faster than we had anticipated, indicating rapid rises in sea echo levels shorter than the hourly collections employed. Plots of peak mean signal power received and direction of the maximum radar return for two different 36-hour periods of time from aboard the OCEANUS are shown in Figure XII-2. Although these first-look results appear promising, radar calibration remains to be done before data analysis can proceed, currently scheduled for June. In addition, surface truth of sea surface temperature must be available before calibration of radar returns with the front can be made.

The second aspect of the experiment, the imaging of the ocean waves using a different data acquisition system, had a hardward failure several days into the KNORR cruise, allowing just three images to be collected. However, of the three images collected aboard the KNORR, one shows unusual sea echo distributions in range and azimuth. This image was presumably collected in the vicinity of the front, because of the observed spatial inhomogeneity. Final correlation will depend upon surface truth records from the KNORR.

Radar Propagation Staff, Radar Division
Naval Research Laboratory - Code 5303
Washington, D. C. 20375
(202) 767-2003

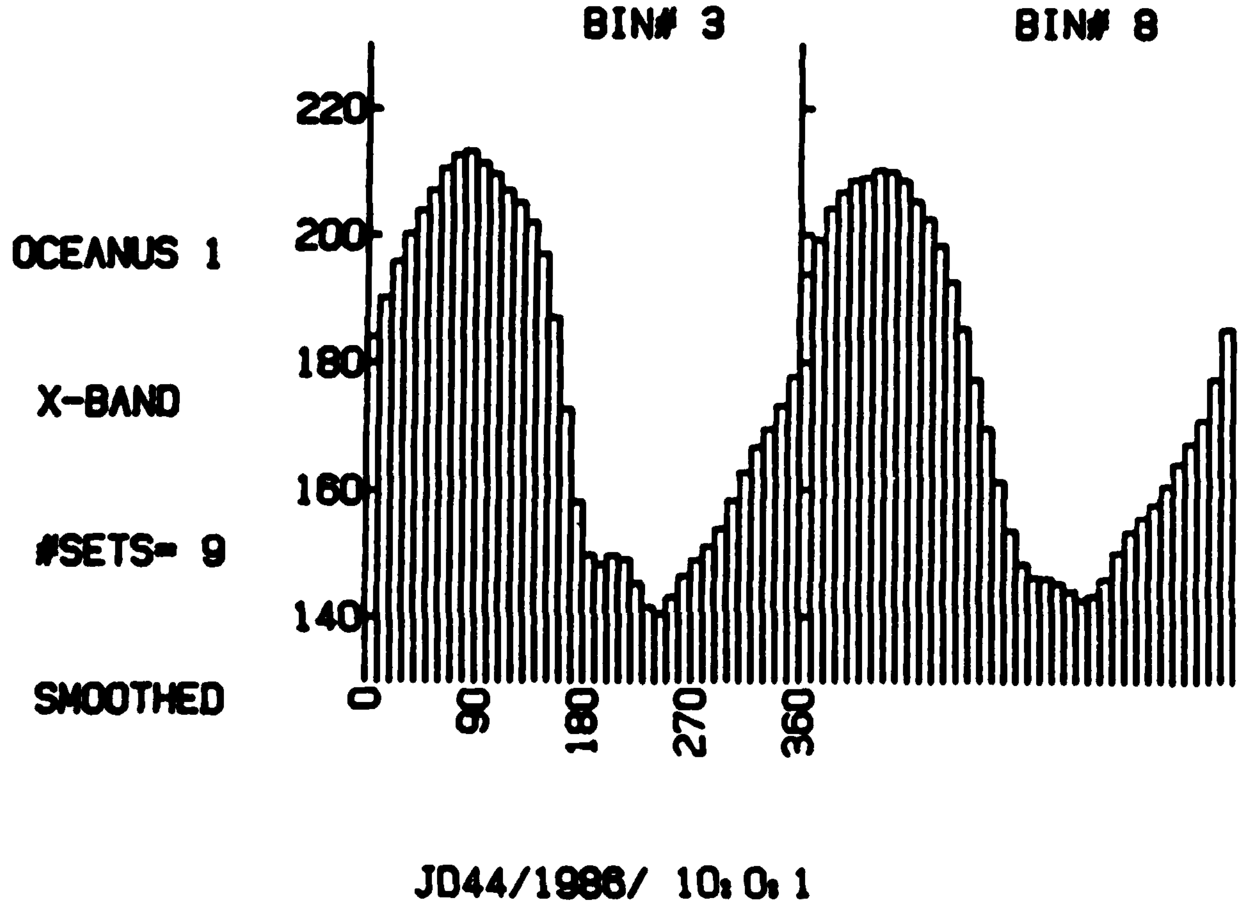


Figure XII-1: Azimuthal Angle Distribution.

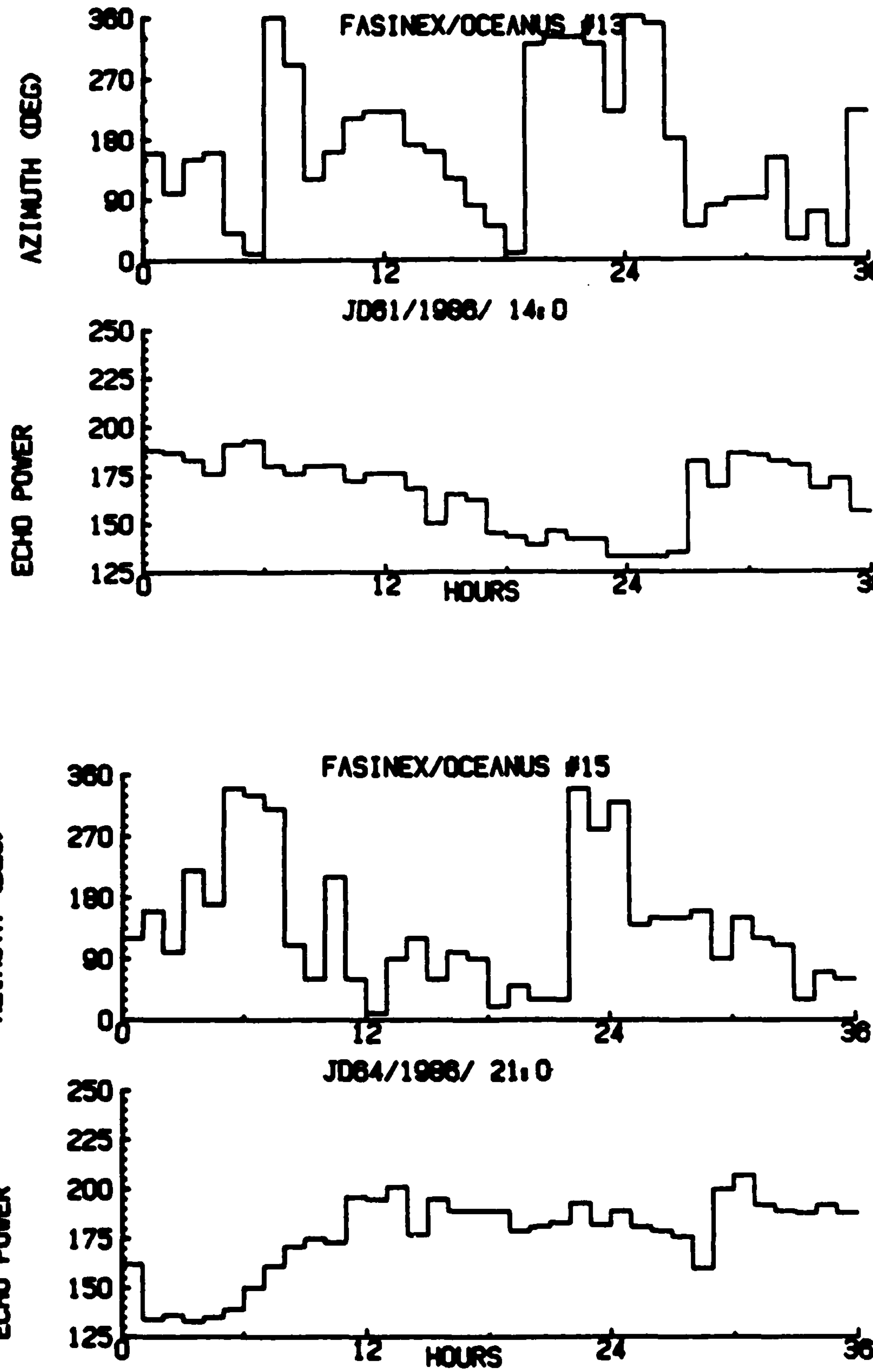


Figure XII-2: Peak Mean Signal Power Received and Direction of Maximum Return.

XII. AVHRR

During FASINEX Phase Two, a NEARSS (Northeastern Area Remote Sensing System) was set up at the Bermuda Biological Station office to receive AVHRR (Advance Very High Resolution Radiometer) satellite images. Using the ATS system, just as set up on KNORR, during Phase One, the images were processed at URI and sent via the Miami Vax to Bermuda.

Both the OCEANUS and ENDEAVOR had fax machines aboard. The plan had been to transmit frequent AVHRR images to the ships to help locate and track the front during the intensive scientific period. Unfortunately, the cloud cover was heavy much of the time. The fax machines did not work on OCEANUS and bearly worked on ENDEAVOR. The NEARSS computer also suffered a damaged disk.

ENDEAVOR was able to receive satellite imagery via INMARSAT. This information was transferred to OCEANUS via the VHF radio when the ships were working closely together.

Peter Cornillon, having returned to URI for Phase Two, knowing the difficulty with transmissions to the ships digitized some AVHRR images and sent them to the ships via telemail whenever possible. This information was plotted up on the ships. With this means of mapping the frontal regions, along with the specific locations of frontal crossing seen from the aircraft, and the real time SST, the ships were able to coordinate their activities to survey along, across, or in the frontal regions.

Participant Summary:

XIV. CRUISE REPORT: ENDEAVOR 141
February 5 - March 11, 1986
A Component of FASINEX

Raymond W. Schmitt
Woods Hole Oceanographic Institution
April 15, 1986

PROJECT: EN-141 was a part of the FASINEX field program. Its goal was to examine the joint response of the atmosphere and ocean to the presence of the Subtropical Convergence Front.

SCHEDULE:

Depart Norfolk, Virginia	-	February 5, 1986
Arrive St. Georges, Bermuda	-	February 8, 1986
Depart St. Georges	-	February 11, 1986
Arrive Woods Hole, Mass.	-	March 10, 1986

REGION OF INVESTIGATION:
Western North Atlantic, Southwest of Bermuda.

FUNDING / PRINCIPAL INVESTIGATORS:
NSF:OCE 86-015336 / R. W. Schmitt and J. M. Toole

SCIENTIFIC PARTY (BERMUDA - WOODS HOLE):

Dr. Raymond W. Schmitt	WHOI	Co-Chief Scientist
Dr. Neil S. Oakey	BIO	Co-Chief Scientist
Dr. John M. Toole	WHOI	Scientist
Dr. Richard L. Koehler	"	Elec. Engineer
Ms. Mary Woodgate-Jones	"	Research Associate
Ms. Siobhan Knuttel	"	Research Assistant
Mr. Richard Krishfield	"	Research Assistant
Mr. Jack Dellibovi	"	Electronic Technician
Dr. William Large	NCAR	Scientist
Mr. Peter Pozdnekoff	BIO	Marine Technician
Mr. Bruce Wile	"	Marine Technician
Mr. Stephan Borrmann	NPS	Research Technician
Mr. Christopher A. Vaucher	"	Meteorologist
Mr. Paul Johnson	IOS	Marine Technician
Mr. Svein Vagle	"	Graduate Student
Mr. David Nelson	URI	Marine Technician

PURPOSE:

To study the physical structure of the Subtropical Convergence Front, using a ship mounted acoustic Doppler profiler, CTD and XBT surveys, and a new fine- and microstructure profiler (Schmitt/Toole). To examine spatial and temporal variability in upper ocean mixing rates (Oakey). To survey the characteristics of the atmospheric boundary layer near the front (Large, Borrmann, Vaucher). To study wave breaking with acoustical and optical techniques (Johnson, Vagle).

CRUISE NARRATIVE:

The first leg of EN-141 was a transit from Norfolk Va. to St. Georges, Bermuda. Many of the scientists joined the ship in Norfolk in order to set up gear during the transit to Bermuda. Several technicians participated in the transit leg in order to test new data acquisition systems. During this leg word was received that the OCEANUS would be delayed getting to Bermuda, so that there was time for further testing. During the transit, four test CTD stations were done as well as two wire-lowered tests of the fine- and microstructure profiler. ENDEAVOR arrived in Bermuda at 1340 local time on Saturday, Feb. 8.

Additional science gear was aboard the OCEANUS, and the FASINEX plan called for joint work between ENDEAVOR and OCEANUS, so it was essential to wait for the arrival of the other ship. Departure was delayed from Monday morning to Tuesday afternoon. The arrival of the OCEANUS Tuesday morning initiated a very busy time for all concerned, as gear was transferred between the ships and instruments were set up, checked and secured. ENDEAVOR left St. Georges at 1700 local time and rounded the south side of Bermuda into 30 knot winds and heavy seas. OCEANUS departed a day later, in part because some chips for the repair of N. Oakey's computer were late arriving at the airport. These components were later transferred between the ships at sea. The heavy seas caused some discomfort amongst the scientific party, but since the FASINEX working area was two days steam from Bermuda, people were able to get acclimated before intensive work began.

Our first activity upon reaching the FASINEX area (28° N, 70° W) was to locate the front. Our initial survey area was near the moored array so we were unable to deploy XBTs. Using the acoustic Doppler current profiler and surface temperature and salinity observations, we were able to locate a very sharp front. It had a temperature contrast of 1.5 - 2.0 deg. C, and a very pronounced shear on the warm (south) side of the front. We shifted our survey to the west and north in order to map the front, which had moved north of the moored array. When far enough from the array we began to deploy XBTs at 15 min. intervals. After two XBT sections we performed two CTD sections, all of them oriented north - south.

Throughout the cruise we had regular balloon launchings (Rawinsondes) at 0000, 1200 and 1800 hrs (GMT). There was also continuous measurement of meteorological parameters from a mast at the bow. An acoustic Sodar was used to measure wind profiles; this instrument eventually failed due to wave damage. Underway oceanographic measurements included acoustic Doppler currents, sea surface temperatures and conductivities. At times a drifting buoy (WOTAN) was deployed during daylight hours, for optical and acoustical studies of breaking waves and bubble formation. Microstructure measurements were made in the upper ocean with a loosely tethered profiler (EPSONDE) and the new free-fall fine- and microstructure profiler was deployed to greater depths (1000

m). For several hours during "Aircraft" days the ship would heave-to, bow to the wind, for intercomparisons between ship mounted and aircraft-born sensors. We found that we could profitably use the ship time with a mix of morning EPSONDE and profiler deployments, setting of the WOTAN drifter, meteorological station keeping from 1130-1530, afternoon profiler drops and EPSONDE work into the evening. Nights were then spent on surveys or tow-yo sections across the front.

Three times during the cruise we rendezvoused with the OCEANUS. The first time was to transfer some XBTs and computer chips from OCEANUS to ENDEAVOR by using a heaving line. This occurred at 1610 local on Feb. 15. The second meeting occurred from 1020 to 1435 on Feb. 23; six ENDEAVOR scientists visited the OCEANUS for scientific discussions. The final meeting occurred at 1830 on March 5 and involved the transfer of an ARGOS transmitter to the OCEANUS to repair a defective unit on one of the moorings. This was accomplished by casting over a buoyant package which the OCEANUS retrieved.

Our frontal surveys included close work with the OCEANUS during two periods. The first joint survey was a small diamond pattern in which the ENDEAVOR steamed parallel to the OCEANUS, 5 miles inside her track. This occurred from 1830 local on Feb. 25 to 0800 on Feb. 26. During the second period OCEANUS steamed a large rectangular box elongated in the north-south direction. Our intent was to do CTD tow-yo work at night and fine- and microstructure profiling during the day, but heavy weather forced us to stop work and heave to, from 1530 on March 1 to 1915 on March 2. The heartier souls on the OCEANUS were able to keep working with the towed "BATFISH". By the time we were permitted to work again, it was clear that the front was moving out of the survey box, so we continued with our mode of tracking the front at night and making microstructure profiles during the day.

Our final station was a deep CTD cast for calibration purposes at 29°50 N, 68°00 W at 0900 on Mar. 7. Forecasts of heavy weather caused us to leave the area slightly earlier than planned, since it was important to have sufficient time to unload the ship in Woods Hole before it returned to Narragansett. Our northward progress was slowed to 6 knots at times but we did manage to tie up in Woods Hole at 1100 on March 10. Hard work by the science party and crew cleared the ship of gear by 1030 the next morning, when she set sail for Narragansett.

Figure XIV-1	ENDEAVOR 141 Cruise Track
Figure XIV-2	ENDEAVOR 141 CTD Station Positions
Table XIV-1	CTD Station Log
Figure XIV-3	ENDEAVOR 141 XBT Positions
Table XIV-2	XBT Log

Endeavor 141 Cruise Track

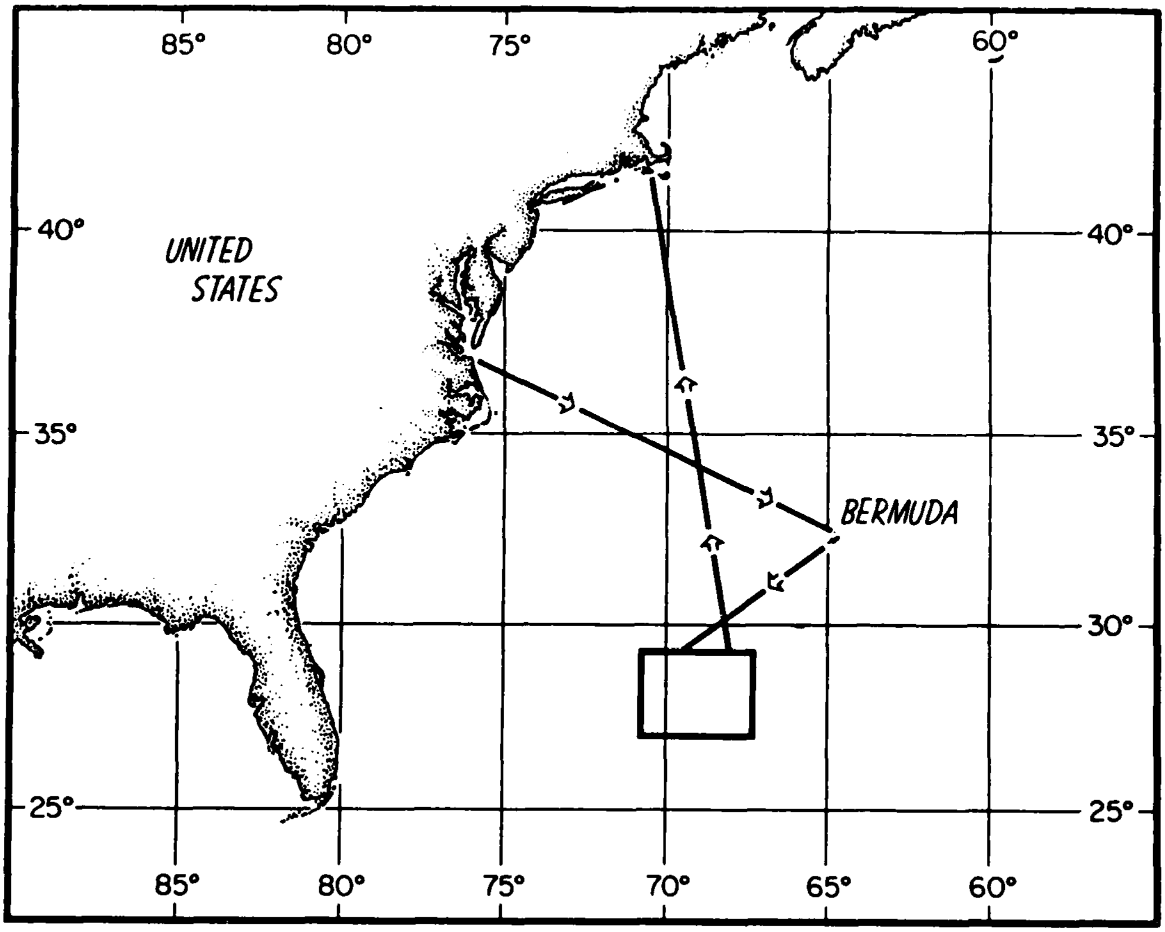


Figure XIV-1: ENDEAVOR 141 Cruise Track.

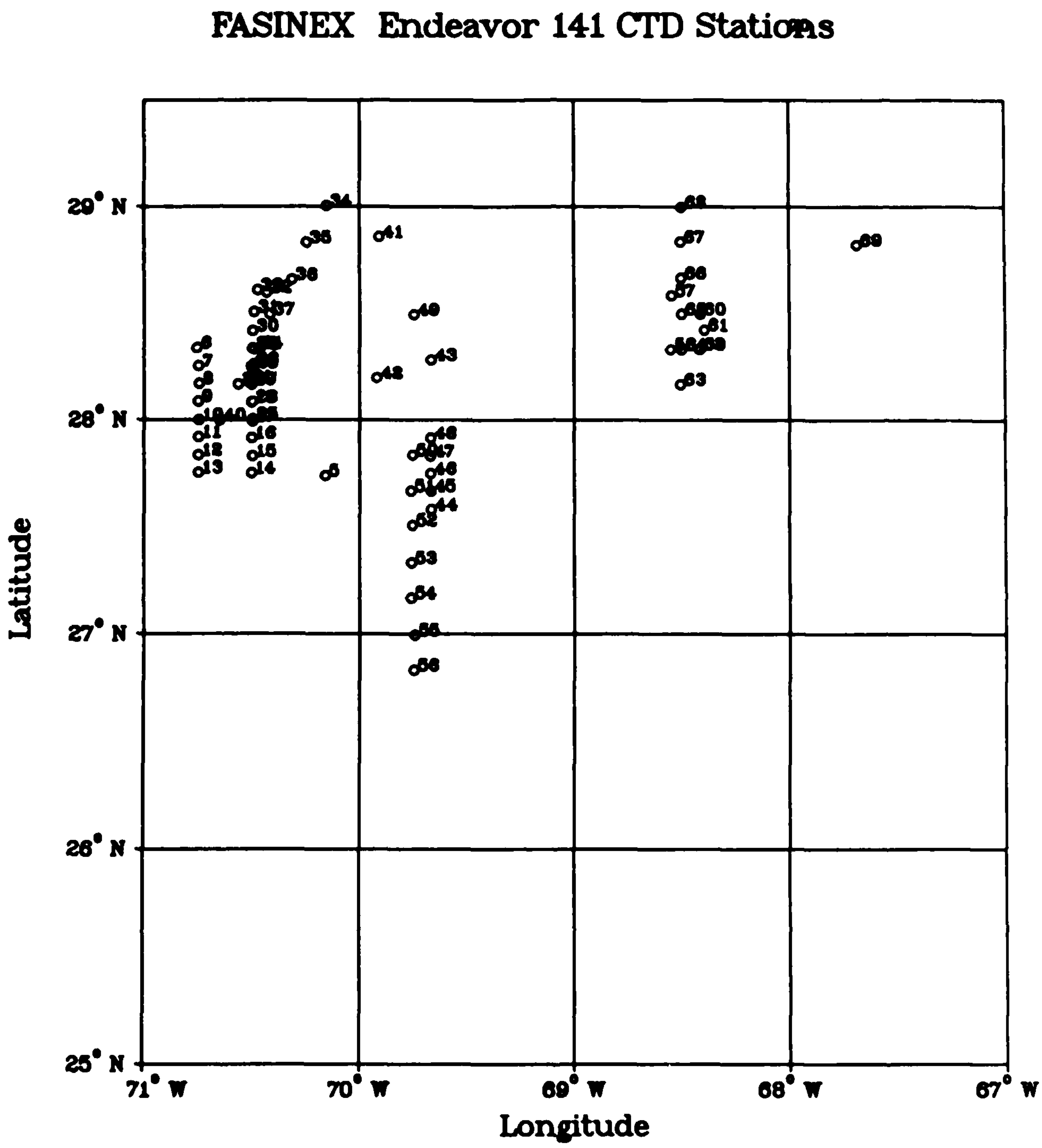


Figure XIV-2: ENDEAVOR 141 CTD Station Positions.

TABLE XIV-1
EN-141 CTD STATION LOG

CTD #	YEAR DAY	START TIME GMT	NORTH LATITUDE (deg. min.)	WEST LONGITUDE (deg. min.)	MAX. PRESS. (db)	COMMENTS
1	37	1945	35 14.50	71 42.90	3821	CTD 7
2	38	1539	33 44.20	68 13.70	3005	CTD 8
3	38	1850	33 36.20	67 57.00	4137	CTD 7
4	38	2304	33 21.80	67 28.80	2658	CTD 9
5	44	1904	27 44.30	70 9.60	1009	CTD 7
6	45	1620	28 20.30	70 45.30	1405	CTD 9
7	45	1754	28 15.20	70 44.85	1215	
8	45	1921	28 10.20	70 44.75	1207	
9	45	2057	28 5.20	70 45.00	1205	
10	45	2225	28 0.00	70 44.80	1195	
11	46	6	27 55.20	70 44.80	1213	
12	46	133	27 50.10	70 44.90	1203	
13	46	334	27 45.20	70 44.90	1201	
14	46	552	27 45.05	70 30.10	1203	
15	46	719	27 49.80	70 29.80	1209	
16	46	855	27 54.90	70 30.00	1189	
17	46	1025	27 59.60	70 29.95	1183	
18	46	1204	28 4.95	70 30.10	1207	
19	46	1320	28 9.90	70 30.00	1207	
20	46	1652	28 14.70	70 29.75	1213	
21	47	1151	28 10.74	70 31.02	457	Tow-yo
22	47	2228	28 15.00	70 30.10	3513	
23	48	54	28 15.78	70 29.52	407	Tow-yo
24	48	2300	28 20.20	70 28.10	3993	
25	49	323	28 0.20	70 29.80	1201	CTD 7
26	49	442	28 5.00	70 29.90	1201	
27	49	557	28 10.10	70 29.90	1199	
28	49	712	28 14.70	70 29.90	1199	
29	49	830	28 20.10	70 29.90	1203	
30	49	958	28 25.10	70 29.85	1201	
31	49	1509	28 30.50	70 29.40	1201	
32	49	1826	28 35.90	70 25.90	1205	
33	50	101	28 36.60	70 28.50	1203	CTD 9
34	50	429	29 0.30	70 9.10	5539	GEOSAT
35	50	835	28 50.00	70 14.80	5543	SECTION
36	50	1306	28 39.60	70 18.80	5525	"
37	50	1657	28 29.80	70 25.00	5533	"
38	50	2139	28 19.90	70 29.40	5535	"
39	51	131	28 10.00	70 33.80	5527	"
40	51	528	27 59.90	70 39.00	5517	"
41	51	1803	28 51.60	69 54.50	1205	
42	52	129	28 11.82	69 55.14	405	Tow-yo (7)
43	54	138	28 16.98	69 40.02	399	Tow-yo (7)
44	55	642	27 34.80	69 40.10	1209	CTD 9
45	55	802	27 40.00	69 40.10	1205	
46	55	925	27 44.90	69 40.20	1193	
47	55	1044	27 49.80	69 40.20	1183	
48	55	1203	27 54.90	69 40.10	1205	

49	56	1452	28 29.75	69 44.85	3505	CTD 7
50	57	1813	27 50.10	69 45.20	1205	CTD 9
51	57	2013	27 40.00	69 45.70	1189	
52	57	2219	27 30.40	69 45.20	1193	
53	58	57	27 19.90	69 45.50	1209	
54	58	329	27 10.10	69 45.60	5553	
55	58	804	26 59.70	69 44.60	1203	
56	58	952	26 49.90	69 44.90	1193	
57	59	2310	28 35.10	68 32.80	1195	CTD 7
58	60	312	28 19.90	68 33.00	1209	
59	60	703	28 20.00	68 24.70	1201	
60	60	703	28 29.90	68 24.80	1205	
61	60	1506	28 25.40	68 23.70	1203	
62	60	1722	28 20.00	68 25.00	1203	
63	62	309	28 10.00	68 30.30	1205	
64	62	502	28 19.90	68 29.90	1217	
65	62	709	28 29.90	68 30.00	1203	
66	62	913	28 40.00	68 30.10	1217	
67	62	1108	28 50.20	68 30.20	1211	
68	62	1313	28 59.90	68 29.90	1209	
69	65	30	28 49.30	67 41.10	400	Tow-yo
70	66	1256	29 49.70	68 0.60	4803	

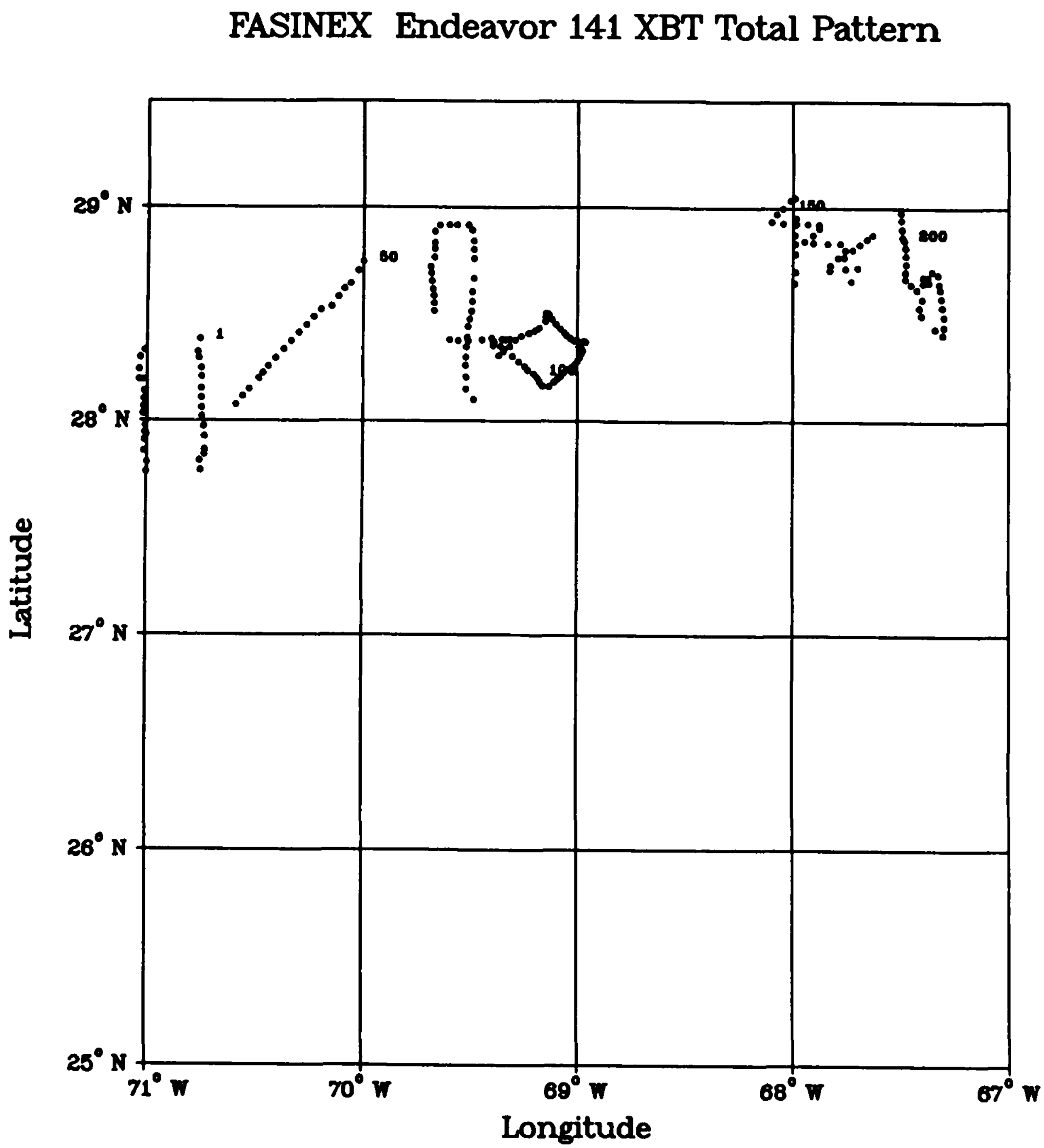


Figure XIV-3: ENDEAVOR 141 XBT Positions.

TABLE XIV-2
EN-141 XBT LOG

XBT #	YEAR DAY	TIME GMT	NORTH LATITUDE (deg. min.)	WEST LONGITUDE (deg. min.)	XBT SURF. TEMP. (deg.C)	BUCKET TEMP. (deg.C)	SURFACE SALINITY (PPT)
1	45	332	28 22.96	70 45.37	21.140	21.2	36.647
2	45	349	28 19.24	70 45.90	21.099	21.3	36.634
3	45	359	28 17.52	70 45.63	21.004	21.4	36.610
4	45	414	28 14.77	70 44.93	21.017	21.0	36.003
5	45	428	28 12.35	70 44.84	20.748	21.0	
6	45	459	28 9.06	70 45.06	21.126	21.4	36.605
7	45	513	28 6.42	70 45.03	21.485	21.5	36.619
8	45	528	28 3.67	70 44.99	22.821	21.5	36.685
9	45	543	28 1.20	70 44.84	23.455	23.2	36.677
10	45	559	27 58.46	70 44.30	23.455	23.4	36.663
11	45	614	27 55.66	70 44.16	23.593	22.7	36.649
12	45	635	27 51.90	70 44.04	23.332	23.5	36.637
13	45	643	27 50.60	70 44.10	23.348	21.8	36.661
14	45	658	27 48.84	70 45.48	23.075	23.0	36.655
15	45	713	27 46.18	70 45.10	23.332	23.3	36.650
16	45	855	27 45.63	71 0.12	22.970	23.1	36.710
17	45	915	27 48.30	71 0.18	22.970	23.0	36.656
18	45	935	27 51.54	71 0.99	23.045	23.2	36.648
19	45	1000	27 54.54	71 0.84	23.181	23.2	36.662
20	45	1020	27 56.61	71 0.78	23.166	23.2	36.665
21	45	1040	27 56.10	71 0.30	23.120	23.0	36.670
22	45	1100	27 58.53	71 0.69	23.060	23.1	36.673
23	45	1120	28 1.92	71 1.26	22.925	22.9	36.669
24	45	1140	28 3.96	71 1.14	22.806	22.8	36.665
25	45	12 0	28 6.00	71 1.02	22.540	22.7	36.663
26	45	1220	28 8.22	71 0.90	22.077	22.4	36.645
27	45	13 0	28 11.44	71 1.26	21.236	21.5	36.617
28	45	14 1	28 11.56	71 2.34	21.236	21.4	
29	45	1419	28 14.31	71 2.28	21.167	21.4	
30	45	1441	28 17.74	71 1.94	20.977	21.0	
31	45	15 1	28 19.75	71 0.79	20.788	21.0	
32	51	9 2	28 4.51	70 35.49	23.060	23.3	36.878
33	51	919	28 6.94	70 33.57	22.925	23.3	36.683
34	51	932	28 8.96	70 31.74	22.970	23.2	36.693
35	51	951	28 11.92	70 29.08	22.895	23.1	36.676
36	51	10 1	28 13.41	70 27.88	22.806	23.1	36.670
37	51	1014	28 15.34	70 26.39	22.806	23.0	36.661
38	51	1029	28 17.64	70 24.30	22.673	22.9	36.660
39	51	1045	28 20.13	70 22.03	22.599	22.9	36.656
40	51	11 0	28 22.32	70 20.01	22.717	22.9	36.657
41	51	1115	28 24.74	70 17.81	22.658	22.8	36.665
42	51	1130	28 26.96	70 15.74	22.408	22.7	36.658
43	51	1145	28 29.20	70 13.73	21.443	21.7	36.632
44	51	1159	28 31.25	70 11.78	21.360	21.7	36.641
45	51	1215	28 32.26	70 8.86	21.415	21.7	36.640
46	51	1231	28 34.95	70 6.96	21.415	21.8	36.642
47	51	1245	28 37.26	70 5.34	21.652	21.8	36.640
48	51	13 1	28 38.69	70 3.55	21.638	21.9	36.640

49	51	1315	28 42.28	70 1.44	21.778	22.0	36.643
50	51	1330	28 44.82	70 0.06	21.666	22.0	36.661
51	56	315	28 6.00	69 29.10	22.380	22.7	36.675
52	56	344	28 8.94	69 31.32	21.373	21.7	36.693
54	56	4 1	28 12.36	69 31.20	21.977	22.2	36.665
55	56	418	28 15.60	69 31.38	22.249	22.5	36.657
56	56	430	28 17.95	69 31.25	22.206	22.6	36.649
57	56	444	28 20.80	69 31.10	22.482	22.9	36.652
58	56	459	28 23.58	69 30.95	22.482	22.8	36.662
59	56	514	28 26.53	69 30.79	22.540	22.7	36.677
60	56	529	28 28.68	69 30.24	22.702	22.9	36.681
61	56	544	28 30.82	69 29.75	22.658	22.9	36.700
62	56	559	28 33.59	69 29.59	22.453	22.7	36.685
63	56	614	28 36.36	69 29.52	22.278	22.5	36.687
64	56	630	28 40.06	69 29.14	22.063	22.3	36.663
65	56	644	28 42.64	69 28.99	22.220	22.5	36.669
66	56	7 0	28 45.65	69 29.14	21.877	22.2	36.665
67	56	714	28 48.24	69 29.28	21.485	21.7	36.647
68	56	729	28 50.64	69 29.22	21.004	21.3	36.640
69	56	745	28 53.61	69 29.73	21.031	21.3	36.642
70	56	758	28 55.12	69 30.79	20.896	21.1	36.618
71	56	816	28 55.14	69 33.96	20.748	21.1	36.610
72	56	829	28 55.13	69 36.14	20.991	21.4	36.658
73	56	844	28 55.03	69 38.73	21.004	21.4	36.637
74	56	9 1	28 53.27	69 40.19	20.991	21.3	36.631
75	56	919	28 50.16	69 40.14	21.457	21.7	36.642
76	56	930	28 48.41	69 40.19	21.963	22.0	36.196
77	56	944	28 46.00	69 40.20	21.778	22.2	36.647
78	56	10 3	28 43.36	69 41.24	22.467	22.7	36.661
79	56	1015	28 41.51	69 41.06	22.263	22.8	36.670
80	56	1029	28 39.31	69 40.84	22.555	22.8	36.683
81	56	1045	28 37.08	69 40.56	22.496	22.8	36.665
82	56	1058	28 35.20	69 40.30	22.453	22.7	36.655
83	56	1112	28 33.14	69 40.20	22.162	22.4	36.670
84	56	1129	28 30.91	69 40.14	22.063	22.4	36.667
85	56	20 6	28 22.70	69 35.84	22.526	22.7	36.666
86	56	2031	28 22.51	69 33.45	21.991	22.4	36.678
87	56	2044	28 22.58	69 30.61	22.613	22.5	36.674
88	56	21 1	28 22.70	69 26.76	22.263	22.3	36.523
89	56	2113	28 23.25	69 24.06	22.613	22.8	36.654
90	56	2130	28 22.86	69 20.28	22.687	22.7	36.656
91	56	2144	28 22.98	69 19.08	22.569	22.7	36.660
92	56	2158	28 22.90	69 21.12	22.599	22.6	36.642
93	56	2214	28 22.20	69 23.44	22.628	22.8	36.659
94	56	2228	28 21.26	69 23.68	22.540	22.8	36.659
95	56	2245	28 20.95	69 21.67	22.613	22.6	36.668
96	56	23 0	28 20.16	69 20.58	22.555	22.7	36.663
97	56	2313	28 18.12	69 18.26	22.526	22.7	36.647
98	56	2329	28 16.61	69 16.42	22.453	22.7	36.661
99	56	2344	28 15.34	69 14.77	22.365	22.4	36.678
100	57	0 1	28 14.35	69 13.98	22.191	22.4	36.675
101	57	014	28 13.23	69 12.24	22.599	22.8	36.652
102	57	029	28 12.29	69 11.30	22.910	23.1	36.647
103	57	044	28 10.93	69 10.74	22.925	23.2	36.669
104	57	1 0	28 9.84	69 9.82	23.060	23.4	36.597

105	57	115	28 9.72	69 8.10	23.135	23.3	36.609
106	57	130	28 10.92	69 6.78	23.195	23.3	36.600
107	57	145	28 11.85	69 5.76	23.060	23.3	36.603
108	57	159	28 12.66	69 4.80	23.150	23.3	36.612
109	57	215	28 13.69	69 3.83	23.150	23.3	36.629
110	57	231	28 14.54	69 2.92	22.985	23.3	36.639
111	57	244	28 15.00	69 1.62	22.940	23.2	36.648
112	57	3 0	28 15.90	69 0.72	22.985	23.2	36.639
113	57	314	28 16.81	69 0.07	22.821	23.1	36.640
114	57	329	28 17.82	68 59.49	22.673	23.1	36.667
115	57	344	28 18.81	68 58.98	22.702	23.0	36.660
116	57	359	28 19.79	68 58.59	22.555	22.8	36.683
117	57	413	28 20.36	68 58.81	21.877	22.1	36.637
118	57	429	28 20.83	68 59.62	21.485	21.8	36.647
119	57	444	28 22.14	68 57.72	21.250	21.6	36.658
120	57	458	28 22.44	68 58.26	21.332	21.5	36.648
121	57	512	28 22.32	68 59.94	21.388	21.5	36.655
122	57	528	28 22.55	69 0.90	21.388	21.6	36.640
123	57	548	28 23.24	69 2.06	21.568	21.7	36.653
124	57	6 1	28 24.02	69 3.04	21.680	21.9	36.653
125	57	614	28 24.84	69 3.78	21.764	22.0	36.655
126	57	630	28 25.86	69 4.88	21.806	22.1	36.659
127	57	644	28 27.10	69 6.08	21.906	22.2	36.679
128	57	659	28 28.54	69 7.14	21.694	22.1	36.687
129	57	715	28 30.00	69 8.04	21.652	22.0	36.716
130	57	730	28 30.28	69 8.80	21.666	21.9	36.670
131	57	744	28 29.14	69 8.93	21.849	22.0	36.767
132	57	759	28 27.91	69 9.05	21.736	22.0	36.747
133	57	815	28 26.04	69 10.82	21.835	22.1	36.692
134	57	830	28 25.36	69 12.03	22.005	22.2	36.678
135	57	843	28 24.66	69 13.68	22.063	22.3	36.669
136	57	859	28 23.81	69 15.78	22.365	22.6	36.695
137	57	913	28 22.72	69 17.42	22.365	22.7	36.751
138	57	928	28 20.94	69 18.90	22.453	22.6	36.675
139	57	946	28 19.54	69 20.79	22.365	22.6	36.691
140	57	10 0	28 18.30	69 22.01	22.423	22.6	36.663
141	64	129	28 39.64	67 43.72	22.177	22.5	36.700
142	64	145	28 39.08	67 59.46	22.336	22.5	36.704
143	64	2 2	28 42.29	67 59.27	22.162	22.5	36.683
144	64	229	28 47.24	67 59.28	22.394	22.6	36.676
145	64	244	28 50.10	67 59.34	22.292	22.5	36.685
146	64	259	28 52.68	67 59.46	22.365	22.5	36.684
147	64	314	28 55.43	67 59.36	22.249	22.4	36.689
148	64	329	28 57.31	67 59.16	21.948	22.2	36.684
149	64	4 1	29 3.03	67 59.40	20.936	21.2	36.693
150	64	414	29 2.30	68 0.78	21.004	21.2	36.669
151	64	429	29 0.06	68 2.85	22.134	21.2	36.696
152	64	443	28 58.44	68 4.50	22.162	21.3	36.712
153	64	459	28 56.30	68 5.95	22.249	22.4	36.729
154	64	515	28 55.95	68 2.79	22.148	22.4	36.699
155	64	531	28 55.80	67 59.04	22.105	22.4	36.726
156	64	545	28 55.74	67 55.94	21.208	21.6	36.688
157	64	559	28 55.56	67 52.70	21.250	21.4	36.680
158	64	614	28 54.42	67 52.68	21.154	21.4	36.694
159	64	629	28 52.63	67 54.41	21.638	21.9	36.692

160	64	644	28 50.83	67 56.74	22.249	22.4	36.716
161	64	659	28 50.45	67 54.38	22.148	22.4	36.694
162	64	715	28 50.28	67 50.32	21.429	21.5	36.679
163	64	729	28 50.22	67 46.88	21.263	21.5	36.693
164	64	745	28 48.36	67 45.48	21.236	21.4	36.686
165	64	8 0	28 46.27	67 47.47	21.099	21.6	36.661
166	64	815	28 44.12	67 49.54	22.091	22.4	36.680
167	64	829	28 42.64	67 49.70	22.220	22.4	36.677
168	64	846	28 43.10	67 45.32	21.540	21.4	36.673
169	64	9 0	28 43.34	67 42.05	20.775	20.9	36.649
170	65	11 5	28 46.32	67 45.74	22.235	22.4	
171	65	1120	28 48.48	67 43.42	22.091	22.4	
172	65	1132	28 49.94	67 41.42	22.120	22.4	
173	65	1143	28 51.42	67 39.40	22.048	22.2	
174	65	1153	28 52.62	67 37.80	21.195	21.4	
175	65	2315	28 40.74	67 23.76	21.017	21.4	36.703
176	65	2328	28 42.32	67 21.32	21.250	21.4	36.705
177	65	2343	28 41.40	67 19.68	21.126	21.3	36.682
178	66	0 1	28 38.78	67 19.35	21.126	21.4	36.687
179	66	015	28 37.27	67 19.01	21.208	21.5	36.682
180	66	030	28 34.73	67 18.70	21.126	21.3	36.676
181	66	044	28 32.20	67 18.40	21.086	21.3	36.679
182	66	059	28 29.58	67 17.98	21.457	21.7	
183	66	115	28 26.73	67 17.96	21.934	22.3	36.706
184	66	130	28 24.58	67 18.29	22.249	22.4	36.742
185	66	147	28 26.22	67 20.42	22.134	22.4	36.696
186	66	216	28 29.96	67 24.22	22.091	22.4	36.706
187	66	230	28 32.12	67 24.88	22.206	22.4	36.692
188	66	244	28 34.52	67 24.08	22.177	22.3	36.699
189	66	3 1	26 53.02	63 16.62	22.005	22.2	36.715
190	66	315	28 39.21	67 22.23	21.610	21.8	36.732
191	66	331	28 40.62	67 22.50	21.181	21.2	36.706
192	66	343	28 39.06	67 23.82	22.134	22.3	36.699
193	66	359	28 37.26	67 25.52	22.235	22.4	36.698
194	66	414	28 38.67	67 27.15	22.220	22.4	36.687
195	66	429	28 40.23	67 28.74	22.220	22.4	36.724
196	66	444	28 42.15	67 28.77	22.134	22.4	36.707
197	66	459	28 44.49	67 28.53	22.220	22.5	36.694
198	66	514	28 46.87	67 28.63	22.322	22.5	36.700
199	66	529	28 49.04	67 28.79	22.380	22.5	36.695
200	66	543	28 51.14	67 29.00	22.105	22.4	36.694
201	66	559	28 51.66	67 29.40	22.278	22.4	36.684
202	66	614	28 52.02	67 29.50	22.336	22.4	36.676
202B	66	628	28 54.21	67 29.71	22.019	22.4	36.696
203	66	644	28 56.70	67 29.94	21.963	22.2	36.696
204	66	659	28 58.82	67 30.00	21.638	21.8	36.700

Participant Summary:

XV. FINE- AND MICROSTRUCTURE PROFILING DURING FASINEX

Raymond W. Schmitt and John M. Toole
Woods Hole Oceanographic Institution
April 30, 1986

Project Objectives:

The FASINEX cruise of the R/V ENDEAVOR was the first use of a new free-fall fine- and microstructure profiler developed at WHOI with DoD and ONR support. The experimental goal was to study the detailed velocity structure of the front, inertial wave climatology, and mixing processes which occur in and around the front.

Vessel:

R/V ENDEAVOR, February 11 - March 10, 1986

Scientific Party Involved:

Dr. R. W. Schmitt	Chief Scientist
Dr. J. M. Toole	Scientist
Dr. R. L. Koehler	Engineer
Mr. J. Dellibovi	Technician

Narrative:

This cruise culminated an intensive two year effort to construct a new fine- and microstructure profiler which incorporates a variety of sensors into one computer-controlled instrument. Profiler features include: full ocean depth capability, computer control of sampling, data storage and operations, four megabytes of solid state memory, and commercially available sensors. The finescale sensors include a CTD, acoustic velocimeter, accelerometers and compass, all sampled at 10 Hz. The microstructure sensors included downward directed fast temperature and conductivity probes, two airfoil shear probes, and wing mounted fast conductivity probes which sample a helical path as the rotating instrument falls through the water. The microstructure sensors are sampled at 200 Hz. The 5 m long cylindrical instrument is launched and deployed with a specially designed cradle which lifts the profiler out of the water, tilts it to a horizontal position and allows it to be moved along rails mounted on the deck. (Figure 1)

All gear for the profiler was loaded aboard ENDEAVOR in Norfolk, Va., Feb. 3-5, 1986. Toole, Koehler and Dellibovi participated in the Norfolk - Bermuda transit in order to test the profiler. This was done with two wire lowerings on Feb. 6 and 8. The instrument was opened for testing and examination in Bermuda; then closed up before we left port. A substantial battery and the use of low power components insured that there would be minimal opening of the instrument at sea. We were able to get 36 dives, all but three to 1000 m, with a single battery pack. An additional three dives were collected after battery replacement. The only other time the instrument was opened was to change gain settings on

the accelerometers. This type of trouble free performance is remarkable for the first use of an instrument and reflects the high quality of the design and workmanship that went into the instrument and the thorough pre-cruise trouble-shooting.

Our sampling strategy was to profile as close as possible to deployments of "EPSONDE", Dr. Neil Oakey's microstructure instrument. A typical station constituted 3-5 EPSONDE casts to 200 m and one profiler dive to 1000 m. We usually attempted to occupy 3 or 4 stations across the front during daylight hours; however, the weather, other FASINEX logistical requirements, and emergencies sometimes prevented complete transects. As many as 5 profiles were made in one day. Two dives were recovered in early morning darkness; these recoveries were risky because of the difficulty in judging distances between profiler and ship. Nevertheless, nighttime operations do appear feasible under good weather conditions. During the cruise there were occasional impacts between the profiler and the ship. Damage to the profiler was minimal, however, because all of the delicate sensors were well below the depth of the bilge keel on ENDEAVOR. The handling rig allowed us to work in a moderate sea state (winds to 20 knots), and one recovery was made in 35 knot winds.

Because of Neil Oakey's participation on this cruise we were able to implement use of the airfoil shear probes developed by T. Osborn. These were used on a total of 10 dives. We found that the profiler had a certain amount of vibrational noise near 60 hz, marginally above the geophysical shear cutoff, which should be eliminated with appropriate filtering of the data. Strong mixing events were quite apparent in the raw record and attempts to isolate the probes from body vibrations were moderately successful in later dives.

The times, deployment and recovery locations, ENDEAVOR event numbers, pressure ranges of fine- and microstructure data recording, and the microsensors used on the various dives are given in Table 1. Acoustic transponders for instrument tracking were tested at two stations but they failed to respond reliably to the signals from the profiler. We will have to use a different type of transponder in future experiments. Dives 19, 20, and 21 were made near Profiling Current Meter (PCM) moorings of C. Eriksen, near the times when the PCM would be making its excursion. These will allow us to intercompare velocity profiles, which is very useful for checking data analysis schemes.

Several exciting features were sampled by the profiler near the FASINEX front. Preliminary data processing conducted on the cruise yielded estimates of the ocean temperature, salinity and east and north velocity profiles versus pressure. Such profiles were available about 2 hours after a dive was completed. Accompanying these data are the microscale quantities of temperature, conductivity and shear. Dive 17 (Figure XV-3) sampled a particularly energetic, short vertical scale internal wave at about 200 m depth

on the warm side of the front. The velocity vector in this feature is seen to rotate clockwise with depth, suggesting a downward propagating near-inertial wave. Strong microstructure activity at the depth of this feature was observed by both the profiler and EPSONDE. Later in the cruise a set of profiles from the warm side of the front revealed a series of well mixed layers stacked in the vertical (Dive 34, Fig XV-4). The surface mixed layer was roughly 75 m deep with a temperature near 22.5 C. Below was found a second weakly stratified zone some 100 m thick with a temperature near 21.2 C. This thermostad could be traced to the surface mixed layer on the cold side of the front. Still deeper was the 18 C thermostad. The velocity profile through the two layers was quite remarkable. Each layer appeared to exhibit slab-like flow with shear zones at the steps between layers. Energetic microstructure was observed in these shear zones. A short time series at this site revealed time dependency to the flow, possibly near-inertial oscillations.

FASINEX was thus a highly successful first cruise for the profiler. The large number of deployments were obtained in spite of frequent episodes of bad weather and the other shipboard activities that were conducted. We are now looking forward to the analysis phase of the experiment and collaborative work with Neil Oakey and the other FASINEX investigators.

Acknowledgments:

The primary engineers working on the new profiler were R. Koehler, E. Mellinger and K. Doherty. They were assisted by K. Fairhurst, K. Wannop, M. Woodward and J. Dellibovi. T. Danforth, K. Prada and T. Sgouros and M. Woodgate-Jones helped to develop software. A. Martin assisted with the Micro-VAX computer. Neil Oakey provided the airfoil shear probes and advice on their electronics. The development of such a complex device as this was no small task and all concerned are thanked for their contributions. We acknowledge the Captain and crew of ENDEAVOR for their ship handling. The profiler was developed with funds from the DoD Instrumentation Program and the Office of Naval Research.

Captions:

Figure XV-1. Schematic of Microstructure Profiler

Figure XV-2. Microstructure profiler drop sites

Table XV-1. The dive numbers, ENDEAVOR event numbers, the 1986 year day and the deployment and retrieval times and positions, for the fine- and microstructure profiler. Also shown are the pressure ranges for the recording of fine and microstructure variables. The microstructure sensors are coded as: T = nose fast temperature, C = nose fast conductivity, S = shear probes, W = wing fast conductivities.

Figure XV-3. Profiles of Temperature (deg. C), Salinity (ppt), and the North and East components of velocity (m/s), for Dive 17.

Figure XV-4. Profiles of Temperature (deg. C), Salinity (ppt), and the North and East components of velocity (m/s), for Dive 34.

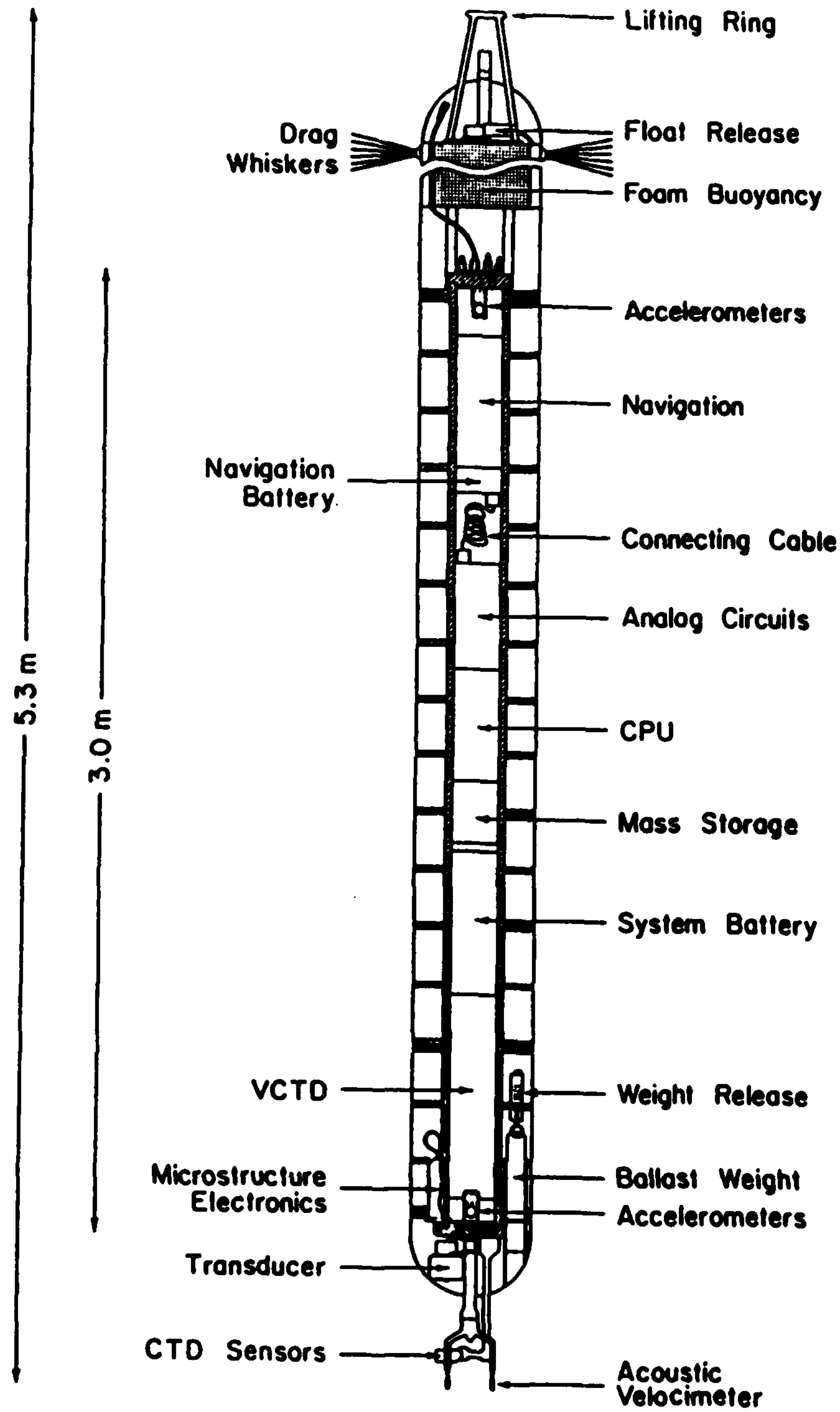


Figure XV-1: Schematic of Microstructure Profiler.

FASINEX Endeavor 141 Microprofiler Dives

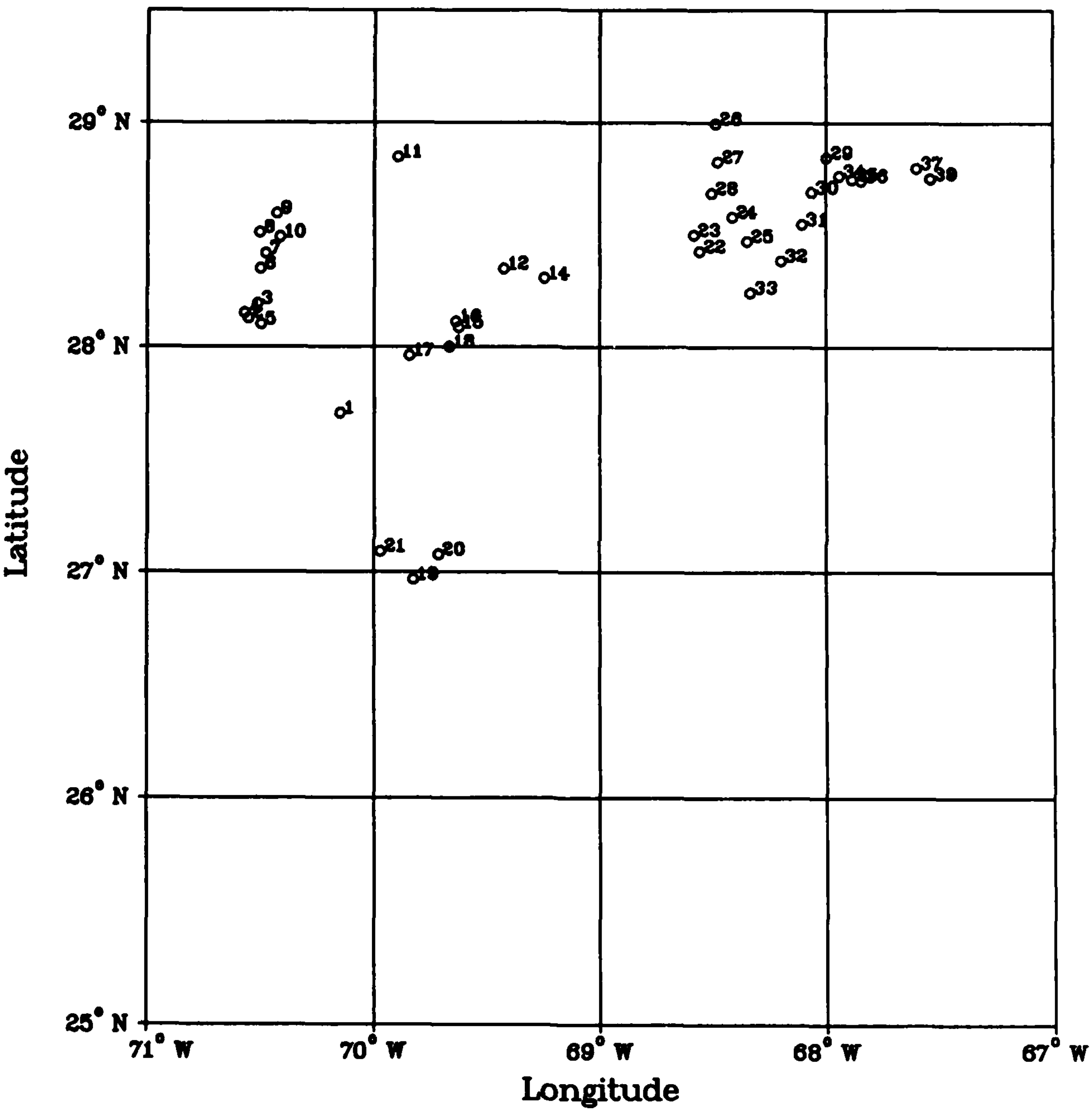


Figure XV-2: Microstructure Profiler Drop Sites.

TABLE XV-1

EN - 141
FINE- AND MICROPROFILER DIVES

DIV #	EV #	'86 YR DAY	DEPLOY TIME GMT	DEPLOY LAT. deg	DEPLOY LAT. min	DEPLOY LONG. deg	DEPLOY LONG. min	RETRIEVE TIME GMT	RETRIEVE LAT. deg	RETRIEVE LAT. min	RETRIEVE LONG. deg	RETRIEVE LONG. min	FINE MAX PRES	MICRO SENS	MICRO P MIN	MICRO P MAX	COMMENT
A	-	37	2100	35	15.6	71	43.2	2125	35	15.6	71	43.2	100	TC	25	100	Wire
B	-	39	1430	32	14.0	64	37.8	1540	32	14.3	64	38.0	1000	TC	25	1000	Wire
1	7	44	1833	27	42.3	70	09.0	1930	27	44.4	70	09.6	500	TC	25	500	Zodiac
2	86	47	1725	28	07.6	70	33.3	1820	28	07.6	70	32.1	1000	TC	25	1000	
3	92	47	2043	28	11.5	70	30.8	2149	28	11.2	70	30.8	1000	TC	25	1000	
4	103	48	1358	28	09.0	70	34.2	1508	28	09.0	70	34.1	1000	TC	25	1000	
5	107	48	1658	28	06.0	70	29.9	1800	28	06.0	70	29.9	1000	TC	25	1000	
6	111	43	2100	28	20.9	70	30.1	2154	28	20.2	70	29.2	1000	TC	25	1000	
7	128	49	1050	28	25.0	70	28.7	1155	28	24.6	70	28.1	1000	TC	25	1000	
8	136	49	1532	28	30.6	70	30.3	1620	28	30.6	70	30.3	1000	TC	25	1000	
9	140	49	1858	28	35.7	70	25.8	2000	28	36.3	70	25.8	520	TC	25	520	Bln snag
10	159	50	1935	28	29.4	70	24.9	2035	28	29.4	70	24.9	1000	TC	25	1000	
11	194	51	1900	28	50.9	69	53.8	1942	28	50.8	69	53.6	1000	TC	25	1000	
12	213	53	1620	28	20.9	69	25.6	1710	28	21.5	69	24.9	1000	TC	25	1000	
14	218	53	2110	28	18.4	69	14.8	2206	28	18.6	69	15.4	1000	TC	25	1000	
15	227	54	1305	28	05.2	69	37.5	1354	28	04.5	69	38.2	1000	TCS	25	500	Trnspndr
16	230	54	1523	28	06.8	69	38.2	1625	28	08.0	69	38.2	1000	TCS	25	500	Bln Snag
17	248	55	1419	27	57.7	69	50.6	1508	28	57.5	69	49.6	1000	TCS	25	500	
18	255	55	2101	28	00.0	69	40.0	2155	27	59.8	69	40.8	250	TCS	25	250	Con Short
19	377	58	1213	26	58.1	69	49.5	1303	26	58.4	69	49.6	1000	TC	25	1000	F5
20	381	58	1612	27	04.7	69	42.8	1705	27	04.7	69	42.8	1000	TC	25	1000	F3
21	387	58	2036	27	05.5	69	58.2	2125	27	05.7	69	58.3	1000	TC	25	1000	F9
22	396	59	1640	28	25.6	68	33.5	1736	28	25.4	68	33.7	1000	TC	25	1000	
23	399	59	2010	28	30.0	68	35.0	2107	28	28.6	68	34.0	1000	TC	25	1000	
24	412	60	0909	28	34.8	68	24.8	1000	28	33.8	68	24.9	1000	TC	25	1000	
25	416	60	1217	28	28.3	68	20.9	1304	28	31.1	68	23.3	1000	TC	25	1000	
26	442	62	1347	28	59.8	68	29.3	1445	28	59.2	68	28.6	1000	TC	25	1000	
27	449	62	1735	28	49.6	68	28.7	1427	28	49.6	68	28.7	1000	TC	25	1000	
28	451	62	1950	28	41.2	68	30.3	2050	28	41.3	68	28.8	1000	TC	25	1000	
29	458	63	1014	28	50.8	67	59.9	1120	28	50.6	67	59.1	1000	TC	25	1000	
30	462	63	1301	28	41.5	68	03.8	1340	28	41.0	68	02.9	1000	TC	25	1000	
31	468	63	1618	28	32.9	68	06.3	1705	28	32.7	68	05.6	1000	TC	25	1000	
32	473	63	1850	28	23.1	68	11.9	1938	28	23.2	68	12.0	1000	TC	25	1000	
33	478	63	2135	28	14.5	68	20.0	2225	28	14.7	68	19.9	1000	TC	25	1000	
34	516	64	1035	28	45.9	67	56.4	1130	28	46.4	67	56.2	1000	TCS	25	500	
35	522	64	1415	28	45.0	67	53.0	1513	28	44.3	67	53.7	1000	TCS	25	500	
36	526	64	1650	28	44.6	67	50.6	1745	28	44.3	67	49.6	1000	TCS	25	500	
37	543	65	1416	28	48.0	67	36.0	1500	28	48.0	67	35.5	500	TCSW	25	500	
38	546	65	1717	28	45.2	67	32.4	1754	28	45.2	67	32.3	500	TCSW	25	500	Trnspndr
39	549	65	2008	28	45.1	67	32.3	2050	28	43.8	67	31.7	500	TCSW	25	500	

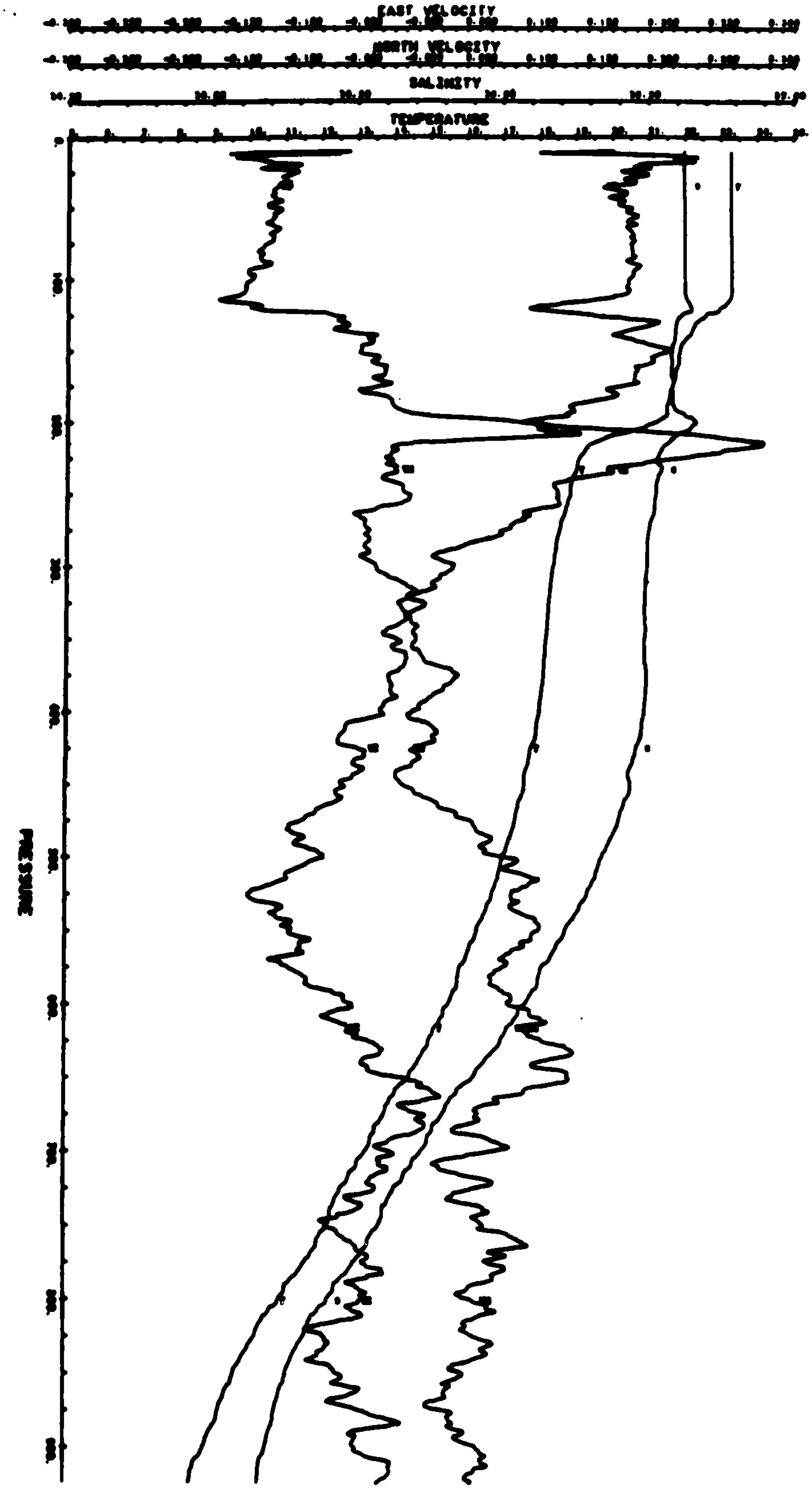


Figure XV-3: Profiles of Temperature (deg. C), Salinity (ppt), and the North and East components of velocity (m/s), for Dive 17.

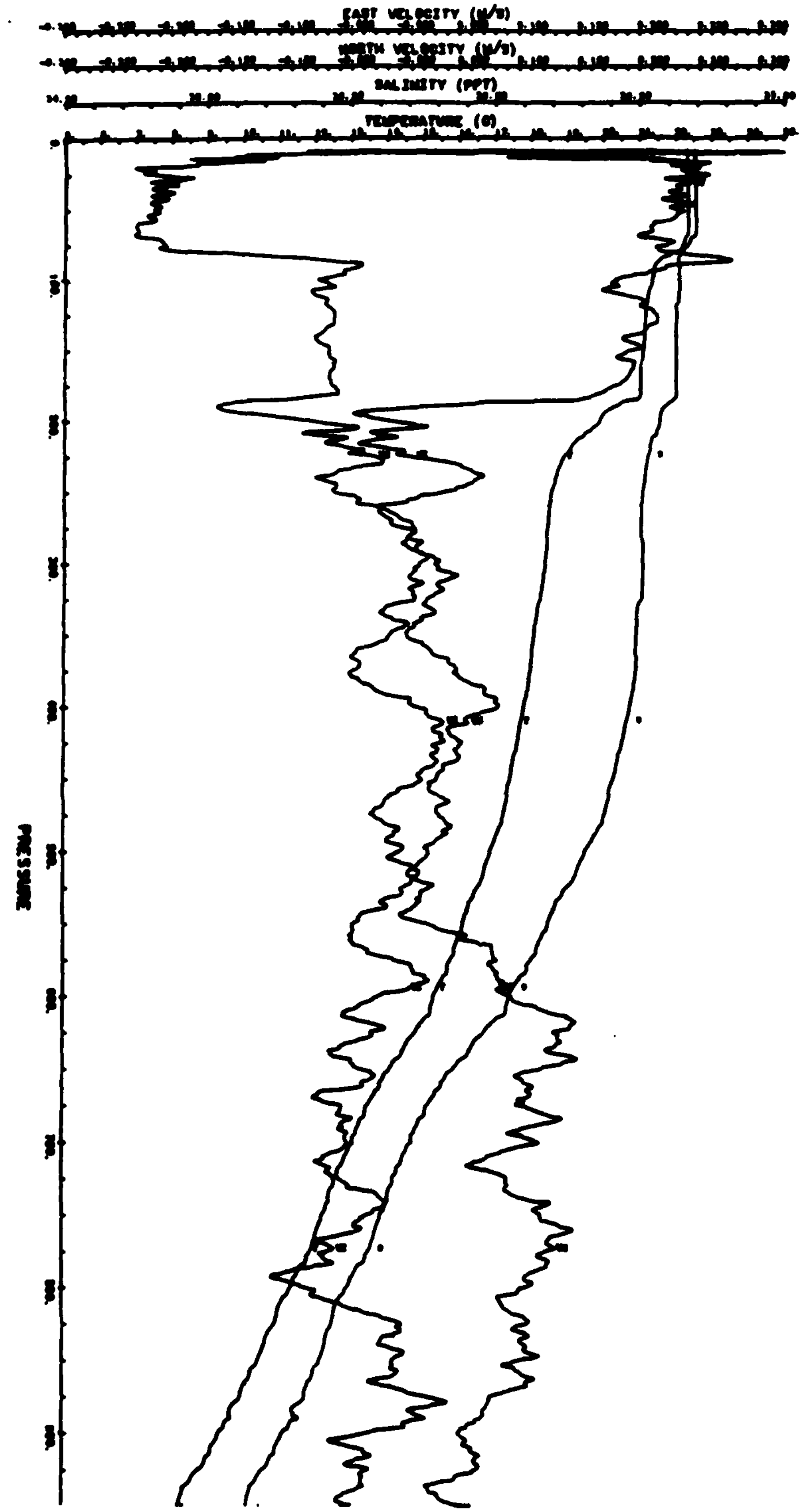


Figure XV-4: Profiles of Temperature (deg. C), Salinity (ppt), and the North and East components of velocity (m/s), for Dive 34.

Participant Summary:

XVI. EPSONDE Microstructure Profiling During FASINEX

N. S. Oakey, Bedford Institute of Oceanography

Project Objectives:

The FASINEX cruise of the R/V ENDEAVOR provided an opportunity to examine the spatial and temporal variability of microstructure in the upper few hundred meters of an oceanic front in response to atmospheric forcing. Data are to be analyzed to provide estimates of vertical eddy diffusivity, dissipation and χ_T as a function of depth at, and near, a front.

Vessel: R/V ENDEAVOR, February 11-March 10, 1986

Scientific Party Involved:

Dr. N. S. Oakey	Chief Scientist
Mr. P. Pozdnekcff	Technician
Mr. B. Wile	Technician

Narrative:

This cruise used the tethered free fall instrument EPSONDE developed at the Bedford Institute of Oceanography by N. Oakey over the past three years. EPSONDE has been used in three major cruises prior to FASINEX, but was upgraded to include a CTD for the FASINEX study. EPSONDE consists of a tethered free fall vehicle, handling system and computer data logger used to measure microstructure to dissipation scales. The instrument has two airfoil shear probes, a thin film thermometer, fast thermistor (FP07), a CTD using a strain gauge pressure transducer, Neil Brown 3 cm conductivity cell and an FP14 thermistor. A variety of engineering measurements, such as tilt, are also recorded. For the microstructure sensors, both the time varying and the derivative signal are recorded to increase dynamic range. Sensor channels are multiplexed at a rate of 256 HZ and submultiplexed at 1/2 speed or 1/8 speed, depending on the sensor capability. A 12-Bit digitizer is used with range selection for conductivity, temperature and pressure. A USART pair is used to telemetry the data (at 38.4 K baud) from the EPSONDE profiling vehicle through a Kevlar four conductor wire to the surface. A deck unit reconstructs parallel data words with ID bits and synchronizing bits for data logging on a computer. The deck unit also reconstructs analog signals for viewing in real time on multichannel analog recorders. The computer used to log data is an INTEL 310/40R, but during FASINEX it failed before the cruise started and an EAGLE-PC was used. The system also includes a winch, sheave-block, capstan system for handling the Kevlar wire without damage.

The equipment was loaded on the R/V ENDEAVOR in Norfolk, Virginia, February 3-5, 1986. Oakey, Pozdnekoff and Wile participated in the Norfolk-Bermuda transit, though no over-the-side tests were done. All systems were thoroughly bench tested and operational.

A major setback occurred in Bermuda when the principal computer (INTEL 310) failed. (It was repaired at the chip level aboard ship, but only very near the end of the experiment.) Data were recorded on an EAGLE-PC computer, but the quality of the data was reduced by signal loss during disk writes. Because of the small disk available, and difficulty in storing on streamer tapes, the quantity of data was also reduced.

A second setback occurred in the first station when the bilge keel intercepted EPSONDE and destroyed all sensors except conductivity. These were replaced with spares and the instrument fitted with a probe guard manufactured on the ENDEAVOR by the Chief Engineer. Thanks to his efforts, the danger of damaging probes was very reduced and, in fact, did not happen again. The guard ring, however, probably increased the vehicle vibration noise.

The only other problem experienced was related to slip rings and related data telemetry, which failed two or three times. This problem has never occurred before, and no spare slip rings were in our supplies which required rebuilding the ones we had. No problems were experienced with the winch, capstan or sheave-block.

During the experiment 39 stations were attempted with a total of 157 profiles, most to deeper than 200 m. These were at various positions with respect to the front, and they are listed in the EPSONDE STATION LOG (Table XIX-1) at the end.

For analysis, data were transferred from the streamer tape medium used on the EAGLE-PC to the streamer tape medium used on the INTEL 310 system. Because of the differences in formats, this could only be done efficiently by developing a special data link between the two machines. This job, done after the equipment returned to the Bedford Institute, required several weeks. There has been no attempt to date to do spectral analysis of the data to obtain ϵ and χ_T. This will be done starting this fall.

Several stations were done simultaneously with the Fine and Microstructure Profiler (Schmitt and Toole), and it is hoped that data from both instruments may be compared.

The FASINEX study thus provided a significant number of microsctructure profiles at and near an oceanic front. The data appears to be of high enough quality that meaningful estimates of ϵ and χ_T may be made and used to examine frontal mixing processes.

Acknowledgements:

We would like to thank the Captain, Chief Engineer and crew of the R/V ENDEAVOR for their assistance during operations. A particular thank-you is also directed to the URI marine technicians, who were instrumental in repairing our computer.

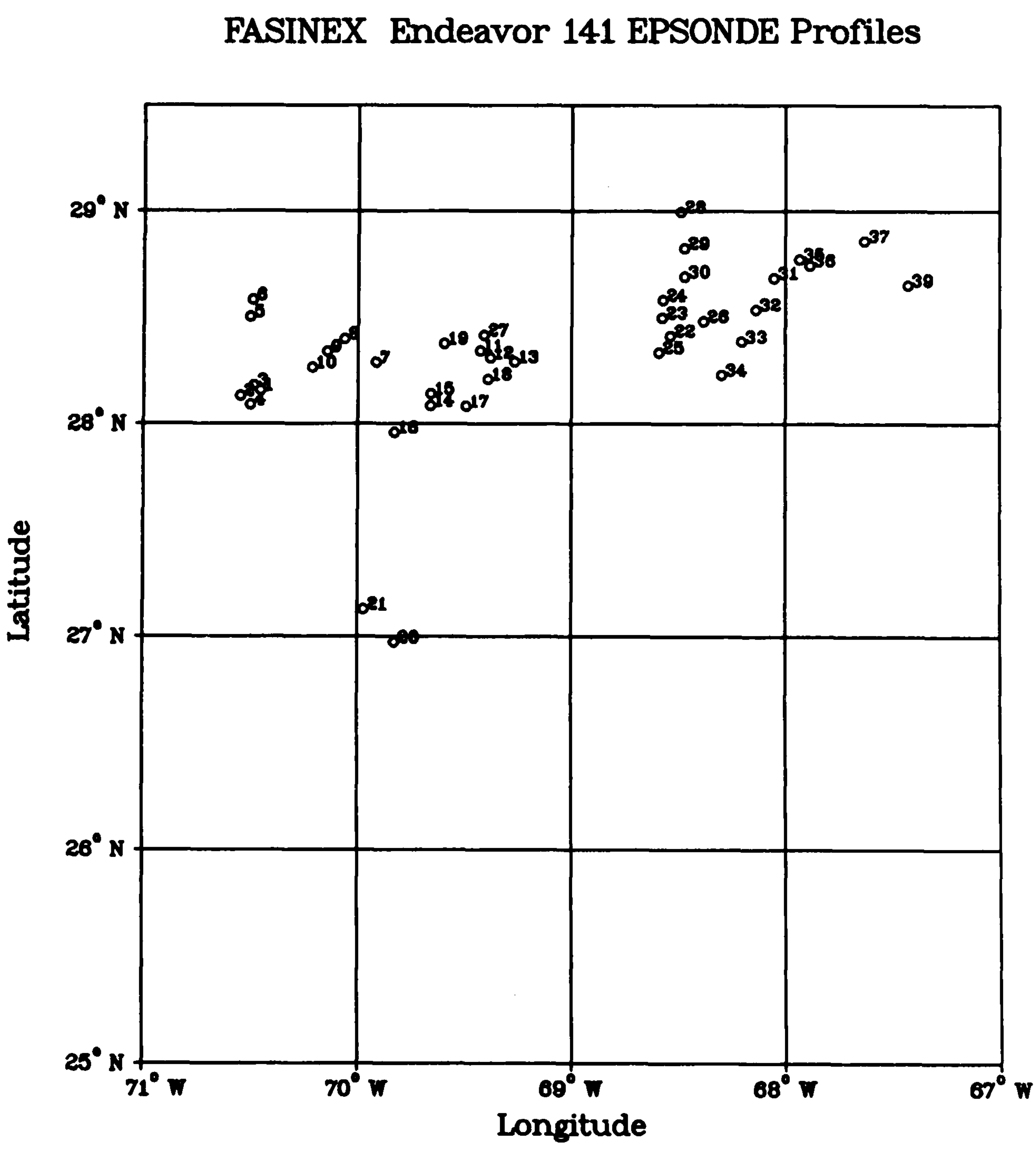


Figure XVI-1: EPSONDE Profile Positions.

TABLE XVI-1

EPSONDE STATION LOG

FASINEX FEBRUARY-MARCH 1986

STATION	DAY	HOUR GMT	EN141 EVENT	LAT. °N	LONG. °W	PROFILES	DEPTH (m)	COMMENTS
1	46	1502	75	28°09.4'	70°27.3'	2	55	Broke sensors on Bilge keel.
2	47	1846	88	28°07.9'	70°33.0'	1	200	
3	48	1225	101	28°10.8'	70°29.2'	6	200	Noisy on way up.
4	48	1600	105	28°05.4'	70°30.2'	4	225	Noisy data.
5	49	1340	132	28°30.2'	70°30.3'	6	250	
6	49	2156	145	28°35.0'	70°29.6'	12	250	
7	52	1145	200	28°17.3'	69°54.9'	4	260	
8	52	2130	206	28°24.0'	70°03.7'	4	240	Cold side of front.
9	52	2250	207	28°20.4'	70°08.6'	4	240	At the front.
10	53	0032	209	28°15.9'	70°12.8'	4	240	Warm side of front.
11	53	1545	212	28°20.6'	69°25.6'	4	240	Cold side of front.
12	53	1745	215	28°18.6'	69°22.7'	4	240	In front.
13	53	2020	217	28°17.5'	69°15.9'	4	220	Warm side of front.
14	54	1145	225	28°05.1'	69°39.6'	8	240	Warm side of front.
15	55	0040	235	28°08.4	69°39.5'	10	150	
16	55	1515	250	27°57.5'	69°49.6	5	260	Long way from front.
17	55	2305	257	28°04.9'	69°29.6'	5	180	
18	56	0056	259	28°12.6'	69°23.4'	2	290	Lost signal during 2nd profile.
19	56	-						Aborted bad Slip Rings.
20	58	1310	380	26°58.4'	69°49.6'	2	250	Poor data; data lost.
21	58	2140	389	27°07.7'	69°58.2'	4	230	
22	59	1756	397	28°24.8'	68°32.2'	4	230	
23	59	1932	398	28°29.9'	68°34.6'	4	250	
24	59	2215	401	28°34.9'	68°34.4'	4	260	
25	60	0205	405	28°20.1'	68°35.4'	4	220	South on warm side of front.
26	60	1123	414	28°28.9'	68°23.0'	4	240	
27	60	1412	419	28°25.0'	68°24.5'	2	200	
28	62	1500	446	28°59.8'	68°29.4'	4	260	Cold side of front.
29	62	1700	448	28°49.5'	68°28.3'	4	240	Just on warm side of front.
30	62	1940	453	28°41.5'	68°28.3'	4	240	Warm side of front.
31	63	1350	466	28°41.1'	68°03.2'	4	240	Just on warm side of front.
32	63	1545	467	28°32.2'	68°08.3'	4	260	10 miles further into warm side.
33	63	1828	472	28°23.2'	68°12.2'	4	260	Warm side far from front.
34	63	2044	476	28°13.8'	68°17.8'	4	250	
35	64	1145	519	28°46.4'	67°56.0'	4	260	
36	64	1418	521 524 528	28°44.7'	67°53.1'	5	240	Drifting stn., 1 or 2 drops at 1 hr. spacing.
37	65	1255	-	28°51.6'	67°37.8'	1	200	Bad wire angle - astern
38	65	1325	-					Aborted too near ship.
39	65	2230	552	28°39.1'	67°25.7'	1	240	Aborted, wire astern.

Participant Summary:

XVII. The "WOTAN Drifter"
Sven Vagle, IOS, Canada

This part of FASINEX has to be described as a complete success even though we had some minor technical problems. During the four weeks on the R/V ENDEAVOR we had twelve deployments with an average deployment time of seven hours, which is well over the number of hours we had been allocated before the cruise. We had one deployment at the front, four deployments on the north (cold) side, six deployments on the south (warm) side of the front, and one deployment at 26° 52.4N, 69° 44.1W near the FASINEX mooring containing a 13 channel WOTAN instrument.

We experienced a wide range of weather conditions. During the time the drifter was deployed we had weather conditions ranging from calm sea, no wind, to wind speeds reaching 15 m/s and quite high seas. The amount of precipitation was not as much as one would have hoped but we should have some data from periods when it was raining.

We obtained acoustic backscatter data using four different transducers (28 kHz, 50 kHz, 88 kHz and 200 kHz) from a depth of 24 meters looking up. In addition to this we recorded the ambient sound with two different instruments. One was a broad band ambient sound instrument recording continuously the whole frequency band from 100-40,000 Hz. The other instrument was a Sea Data Corporation WOTAN (Wind Observation Through Ambient Noise) recorder recording 13 channels with narrow band filters entered at 3.0, 4.3, 5.3, 6.5, 8.0, 9.3, 10.8, 12.5, 14.5, 16.8, 19.5 and 25.0 kHz with a sampling interval of 0.87 second. We have more than 75 hours worth of, mostly good, data.

We observed bubble clouds reaching as far as 8-10 meters below the surface during the most windy conditions (12-15 m/s).

As far as the surface wave spectrum is concerned it looks like we might be able to get some useful information out of our echo-sounder data. A computer program has been written to model the vertical motion of the instruments at the end of the rubber cord. The preliminary results suggest that the instrument motion is very small compared to the surface wave motion. Therefore we may be able to obtain wave spectra estimates.

We look forward to the possibility of comparing our measurements with the directional wave spectra obtained by one of the aircraft.

Figure XVII-1 WOTAN Deployment Positions
Table XVII-1 WOTAN Deployment/Recovery Information

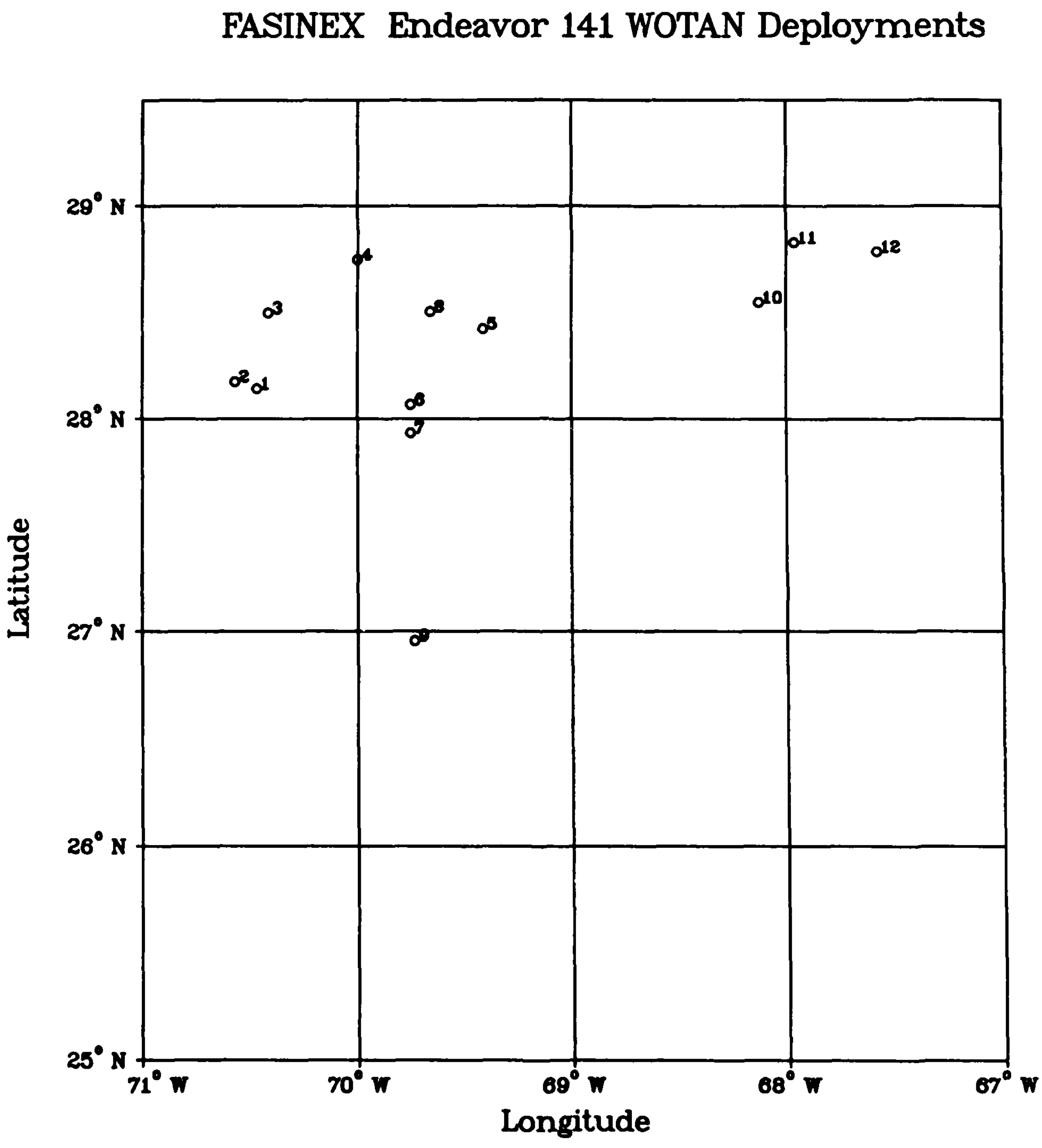


Figure XVII-1: WOTAN Deployment Positions.

TABLE XVII-1

Deployment Number	Date	Deployment Position Latitude	Longitude	Recovery Latitude	Position Longitude	Deployment Time(GMT)	Recovery Time(GMT)	Drift Dir.	Drift Dist.	Drift Speed
1 #	15/2	28 08.5N	70 28.1W	28 09.1N	70 15.8W	14:35	23:05	087°	11 nm	1.34 kn.
2 $	17/2	28 10.4N	70 34.2W	28 11.2N	70 36.6W	11:37	19:43	294°	2.3nm	0.28 kn.
3 *	18/2	28 29.8N	70 24.9W	28 31.7N	70 24.4W	12:49	21:05	012	2.0	0.24
4 *	20/2	28 44.9N	70 00.1W	28 43.4N	69 54.1W	13:41	20:53	106	5.4	0.76
5 *	22/2	28 25.3N	69 24.8W	28 27.2N	69 22.5W	15:06	23:25	045	2.7	0.33
6 $	23/2	28 04.0N	69 45.1W	28 00.5N	69 36,0W	11:11	22:50	114	8.4	0.72
7 $	24/2	27 56.0N	69 45.2W	27 52.7N	69 43.2W	13:28	19:45	151	3.7	0.59
8 *	25/2	28 30.2N	69 39.6W	28 25.4N	69 37.5W	13:21	17:51	155	5.3	1.18
9 %	27/2	26 57.4N	69 44.1W	28 58.6N	69 42.6W	11:26	18:10	048	1.8	0.31
10$	4/3	28 32.8N	68 07.6W	28 33.6N	68 03.5W	17:10	00:50	076	3.7	0.49
11$	5/3	28 49.8N	67 57.8W	28 47.0N	67 47.8W	13:35	20:35	107	9.2	1.31
12$	6/3	28 47.2N	67 34.7W	28 40.6N	67 27.6W	15:35	21:42	136	9.1	1.52

General information about the drifter.Deployments marked with a # were deployments at the front.Deployments marked with a $ were at the warm(south) side of the front,and deployments marked with a * were at the cold(north) side of the front.
The deployment marked with a % (Number 9) was a deployment close to a FASINEX mooring containing a WOTAN instrument.

Acknowledgements

The work done on these cruises was successful, in part, due to the cooperation and skill of the crew of R/V OCEANUS and R/V ENDEAVOR. Funding for the work summarized here was provided by the Office of Naval Research, Contract N00014-84-C-0134 (R. Weller), Contract N000014-85-C-0104 (L. Regier and R. Davis), Contract N00014-86-G-0023 (R. Pollard), Contract N00014-86-WR-24027 (K. Davidson) and by the National Science Foundation, Contract NSF:OCE 86-015336 (R. Schmitt and J. Toole).

We thank Paul Eden who assisted us throughout the cruises with the Applied Technology Satellite (ATS) system. His help and input, almost daily, allowed for a successful communication link for KNORR during the Phases One and Three mooring cruises and between the ships and the Bermuda Biological Station office, where the aircraft scientists were able to pass their flight schedules and observations to the ships during Phase Two.

Cdr. Frank Bub handled the weather forecasting for the aircraft and ships during Phase Two. Some data were input from the ships and along with the Naval Airstation meteorological data, Cdr. Bub prepared a briefing each evening for the aircraft scientists and sent out a report on telemail to the ships. His time and effort was greatly appreciated.

Our thanks to Mary Ann Lucas for her assistance with many tedious aspects of the typing, editing and data processing of the data sets for all the field work included in this document and for her help with the final preparation of this document.

Appendix A: FASINEX Julian Day Conversion Table

The FASINEX field program began in January 1986 and concluded late in June 1986. Several of the data sets have a Julian Day time base. This table is a conversion table from calendar days to Julian Days.

Jan 1 - 001	Feb 1 - 032	Mar 1 - 060	Apr 1 - 091	May 1 - 121	Jun 1 - 152
2 - 002	2 - 033	2 - 061	2 - 092	2 - 122	2 - 153
3 - 003	3 - 034	3 - 062	3 - 093	3 - 123	3 - 154
4 - 004	4 - 035	4 - 063	4 - 094	4 - 124	4 - 155
5 - 005	5 - 036	5 - 064	5 - 095	5 - 125	5 - 156
6 - 006	6 - 037	6 - 065	6 - 096	6 - 126	6 - 157
7 - 007	7 - 038	7 - 066	7 - 097	7 - 127	7 - 158
8 - 008	8 - 039	8 - 067	8 - 098	8 - 128	8 - 159
9 - 009	9 - 040	9 - 068	9 - 099	9 - 129	9 - 160
10 - 010	10 - 041	10 - 069	10 - 100	10 - 130	10 - 161
11 - 011	11 - 042	11 - 070	11 - 101	11 - 131	11 - 162
12 - 012	12 - 043	12 - 071	12 - 102	12 - 132	12 - 163
13 - 013	13 - 044	13 - 072	13 - 103	13 - 133	13 - 164
14 - 014	14 - 045	14 - 073	14 - 104	14 - 134	14 - 165
15 - 015	15 - 046	15 - 074	15 - 105	15 - 135	15 - 166
16 - 016	16 - 047	16 - 075	16 - 106	16 - 136	16 - 167
17 - 017	17 - 048	17 - 076	17 - 107	17 - 137	17 - 168
18 - 018	18 - 049	18 - 077	18 - 108	18 - 138	18 - 169
19 - 019	19 - 050	19 - 078	19 - 109	19 - 139	19 - 170
20 - 020	20 - 051	20 - 079	20 - 110	20 - 140	20 - 171
21 - 021	21 - 052	21 - 080	21 - 111	21 - 141	21 - 172
22 - 022	22 - 053	22 - 081	22 - 112	22 - 142	22 - 173
23 - 023	23 - 054	23 - 082	23 - 113	23 - 143	23 - 174
24 - 024	24 - 055	24 - 083	24 - 114	24 - 144	24 - 175
25 - 025	25 - 056	25 - 084	25 - 115	25 - 145	25 - 176
26 - 026	26 - 057	26 - 085	26 - 116	26 - 146	26 - 177
27 - 027	27 - 058	27 - 086	27 - 117	27 - 147	27 - 178
28 - 028	28 - 059	28 - 087	28 - 118	28 - 148	28 - 179
29 - 029		29 - 088	29 - 119	29 - 149	29 - 180
30 - 030		30 - 089	30 - 120	30 - 150	30 - 181
31 - 031		31 - 090		31 - 151	

Appendix B: Mooring Designations

The FASINEX moorings have several different designations. FASINEX identified each mooring with a letter and number. There was a WHOI Buoy Group designation. There was a buoy identifier. And there was an ARGOS transmitter number. Of the eleven moorings, there were three different types of mooring. The following table summarizes the above-mentioned information:

DESIGNATION											
FASINEX	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F12
WHOI Mooring	829	845	-	846	-	847	-	848	-	849	830
BUOY Identifier		A	PCM-1	C	PCM-2	B	PCM-3	E	PCM-4	D	
ARGOS #		6430		6432		6431		6434		6433	
Mooring Type	subsurface	surface	near-surface	surface	near-surface	surface	near-surface	surface	near-surface	surface	subsurface
Latitude Longitude	27°58.90 69°58.80	27°18.95 70°05.86	27°05.34 69°42.75	27°05.35 69°50.30	26°58.58 69°50.40	27°12.59 69°58.48	27°12.53 69°51.03	26°58.66 69°43.19	27°05.45 69°58.33	27°19.63 69°42.52	25°29.10 70°00.70
Deployment	28 Oct 84 2238	15 Jan 86 2020	17 Jan 86 1811	16 Jan 86 1947	18 Jan 86 1840	26 Jan 86 1715	28 Jan 86 1852	27 Jan 86 1748	29 Jan 86 1806	1 Feb 86 1801	29 Oct 84 1724
Recovery	18 Jun 86 1721	14 Jun 86 0950	16 Jun 86 1352	15 Jun 86 2133	16 Jun 86 2011	14 Jun 86 2151	17 Jun 86 1108	15 Jun 86 1333	Lost	10 Jun 86 0545	13 Jun 86 1957
Data Days	598	150	150	150	149	139	139	139	0	103	592
Instrument Depths	225 325 550 625 700 1100 4100	met 10 20 30 40 80 120 160 700	20 ↓ 200	met 10 20 30 40 80 120 160 700 1000 4000	20 ↓ 200	met 10 20 30 40 80 120 160 700	20 ↓ 200	met 10 20 30 40 80 120 160 700 1000 4000	20 ↓ 200	met 10 20 30 40 80 120 160 700	225 325 550 625 700 1100 4100

All times are UTC.

DOCUMENT LIBRARY

November 21, 1986

Distribution List for Technical Report Exchange

Institute of Marine Sciences Library
University of Alaska
O'Neill Building
905 Koyukuk Ave., North
Fairbanks, AK

Attn: Stella Sanchez-Wade
Documents Section
Scripps Institution of Oceanography
Library, Mail Code C-075C
La Jolla, CA 92093

Hancock Library of Biology & Oceanography
Alan Hancock Laboratory
University of Southern California
University Park
Los Angeles, CA 90089-0371

Gifts & Exchanges
Library
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, NS, B2Y 4A2, CANADA

Office of the International
Ice Patrol
c/o Coast Guard R & D Center
Avery Point
Groton, CT 06340

Library
Physical Oceanographic Laboratory
Nova University
8000 N. Ocean Drive
Dania, FL 33304

NOAA/EDIS Miami Library Center
4301 Rickenbacker Causeway
Miami, FL 33149

Library
Skidaway Institute of Oceanography
P.O. Box 13687
Savannah, GA 31416

Institute of Geophysics
University of Hawaii
Library Room 252
2525 Correa Road
Honolulu, HI 96822

Library
Chesapeake Bay Institute
4800 Atwell Road
Shady Side, MD 20876

MIT Libraries
Serial Journal Room 14E-210
Cambridge, MA 02139

Director, Ralph M. Parsons Laboratory
Room 48-311
MIT
Cambridge, MA 02139

Marine Resources Information Center
Bldg. E38-320
MIT
Cambridge, MA 02139

Library
Lamont-Doherty Geological Observatory
Colombia University
Palisades, NY 10964

Library
Serials Department
Oregon State University
Corvallis, OR 97331

Pell Marine Science Library
University of Rhode Island
Narragansett Bay Campus
Narragansett, RI 02882

Working Collection
Texas A&M University
Dept. of Oceanography
College Station, TX 77843

Library
Virginia Institute of Marine Science
Gloucester Point, VA 23062

Fisheries-Oceanography Library
151 Oceanography Teaching Bldg.
University of Washington
Seattle, WA 98195

Library
R.S.M.A.S.
University of Miami
4600 Rickenbacker Causeway
Miami, FL 33149

Maury Oceanographic Library
Naval Oceanographic Office
Bay St. Louis
NSTL, MS 39522-5001
ATTN: Code 4601

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. WHOI-86-36	2.	3. Recipient's Accession No. AD-A177 776
4. Title and Subtitle FASINEX Frontal Air-Sea Interaction Experiment (January - June 1986) Cruise Summaries for FASINEX Phase Two R/V OCEANUS Cruise 175 R/V ENDEAVOR Cruise 141			5. Report Date September 1986
			6.
7. Author(s) Nancy J. Pennington, Robert A. Weller			8. Performing Organization Rept. No. WHOI-86-36
9. Performing Organization Name and Address Woods Hole Oceanographic Institution Woods Hole, Massachusetts 02543			10. Project/Task/Work Unit No.
			11. Contract(C) or Grant(G) No. (C) N00014-84-C-0134, NR 083-400 (G)
12. Sponsoring Organization Name and Address Office of Naval Research			13. Type of Report & Period Covered Technical Report
			14.

15. Supplementary Notes

This report should be cited as: Woods Hole Oceanog. Inst. Tech. Rept. WHOI-86-36.

16. Abstract (Limit: 200 words)

The Frontal Air-Sea Interaction Experiment (FASINEX) was a study of the response of the upper ocean to atmospheric forcing in the vicinity of an oceanic front in the subtropical convergence zone southwest of Bermuda, the response of the lower atmosphere in that vicinity to the oceanic front, and the associated two-way interaction between ocean and atmosphere. FASINEX began in the winter (January 1986), concluded in the early summer (June 1986) and included an intensive period in February and March. The experiment took place in the vicinity of 27°N, 70°W where sea-surface-temperature fronts are climatologically common.

Measurements were made from buoys, ships, aircraft and spacecraft. This report summarizes the shipboard work done on R/V OCEANUS and R/V ENDEAVOR during Phase Two, the dual ship/multi-aircraft measurement period. The two ships worked individually, jointly and as ground truth for the aircraft during the month. Each ship carried specialized instrumentation for measuring oceanographic and meteorological parameters. Information describing the sampling stategy, station positions and times are included. This report contains summaries of the data collected and some preliminary results.

17. Document Analysis a. Descriptors

1. air-sea interaction
2. FASINEX
3. oceanic front

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement Approved for publication; distribution unlimited.	19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 174
	20. Security Class (This Page)	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

END

4-87

DTIC